

12. COMPLIANCE TEST EXECUTION....Continued

BRP, BP1, BP2, BP3 AND BP4

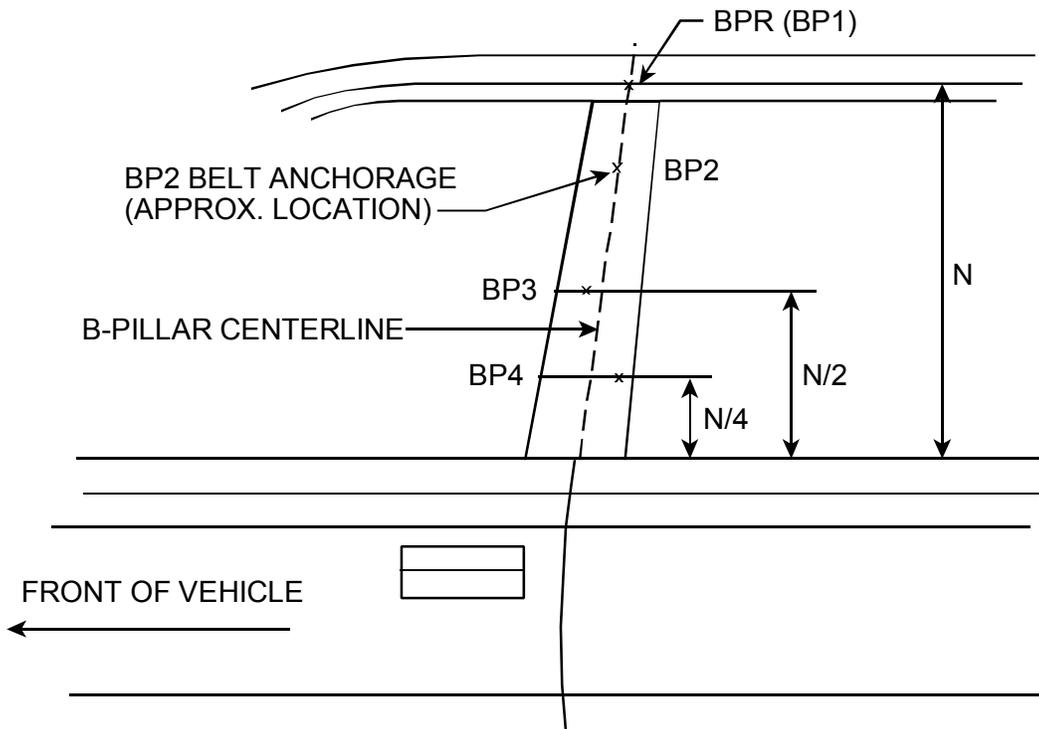


FIGURE 11

BRP, BP1, BP2, BP3 AND BP4 (CONT'D)

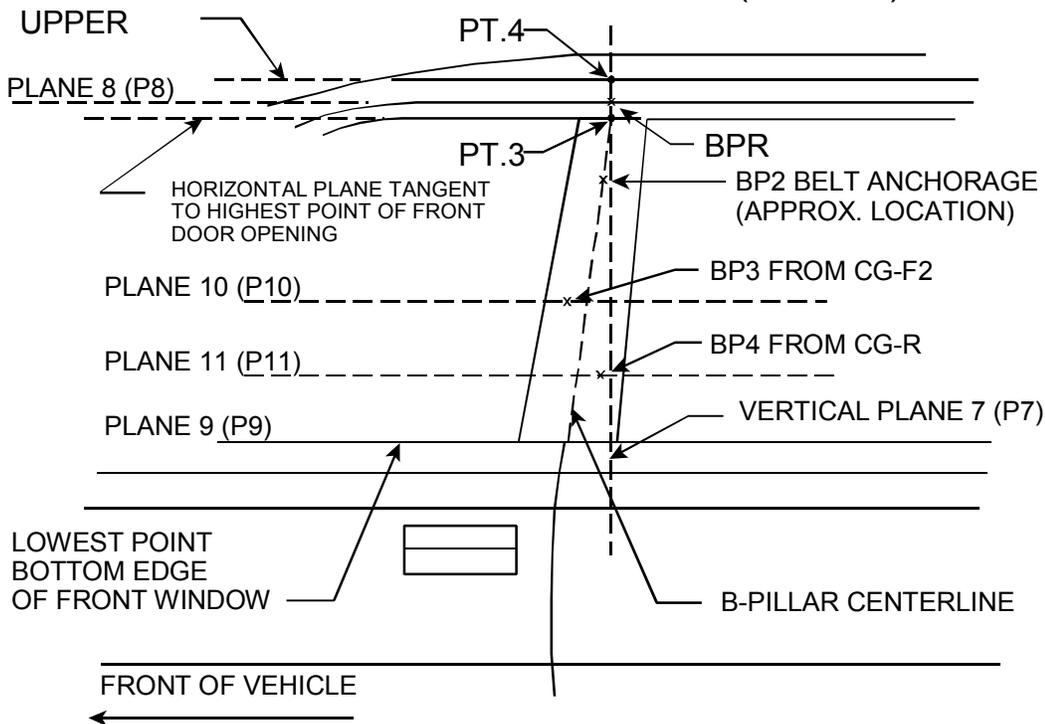


FIGURE 12

## 12. COMPLIANCE TEST EXECUTION....Continued

### 12.6.4 OTHER PILLAR TARGETS - OP1, OP2

#### A. Target OP1

If a seat belt anchorage is located on the pillar, Target OP1 is any point on the anchorage. For adjustable anchorages, position the anchorage midway between the two extreme adjustment positions. If the anchorage has distinct adjustment positions, none of which is midway between the two extreme positions, adjust the anchorage to the nearest position above the midpoint.

If a seat belt anchorage is NOT located on the pillar, establish Target OP1 as follows:

- (1) Establish a horizontal plane through the highest point of the highest adjacent door opening. If there is no adjacent door opening, establish a horizontal plane through the highest point of the highest adjacent daylight opening. Figure 13 illustrates the referenced locations.
- (2) Establish the centerline of the width of the pillar, as viewed laterally from the vehicle interior.
- (3) Locate Point 5, on the vehicle interior, at the intersection of the plane established in item 1 above and the pillar centerline.
- (4) Locate a transverse vertical plane, Plane 12, through Point 5.
- (5) Locate Point 6, on the vehicle interior, at the intersection of Plane 12 and the plane defining the nearest longitudinal edge of the upper roof (Plane G or H, as appropriate).
- (6) Determine the distance, measured along the vehicle interior surface, between Point 5 and Point 6 in Plane 12.

The other pillar reference point (OPR) is located at the middle of the line between Point 5 and Point 6.

Target OP1 is located at point OPR.

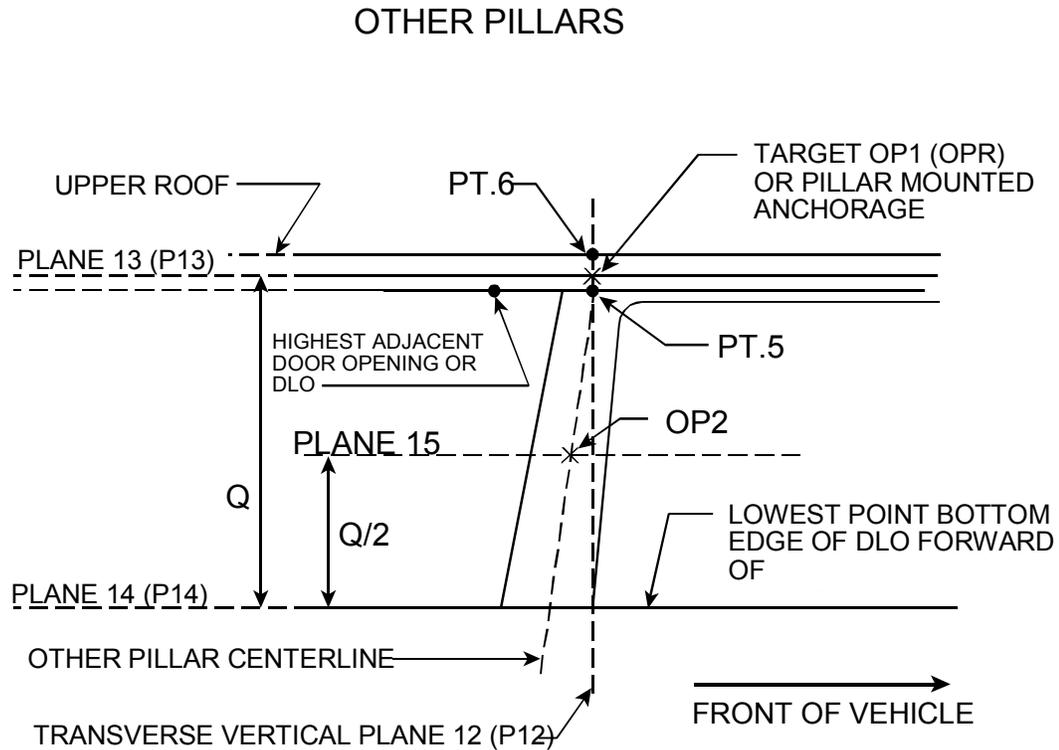
#### B. Target OP2

- (1) Locate the horizontal plane, Plane 13, intersecting Point OPR.
- (2) Locate a horizontal plane, Plane 14, passing through the lowest point of the daylight opening forward of the pillar.

## 12. COMPLIANCE TEST EXECUTION....Continued

- (3) Locate a horizontal plane, Plane 15, half the distance between Plane 13 and Plane 14.

Target OP2 is located on Plane 15 at the centerline of the pillar.



**FIGURE 13**

**NOTE:** Identify the specified other pillar targets (OP1, OP2) for each other pillar.

### 12.6.5 REARMOST PILLAR TARGETS - RP1, RP2

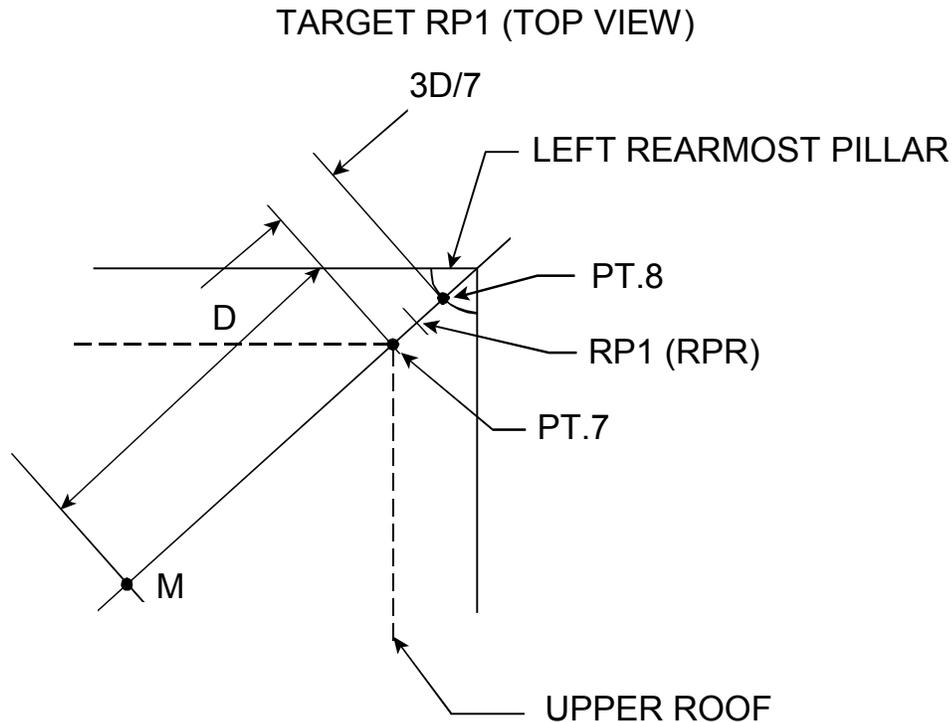
#### A. Rearmost Pillar Reference Point and Target RP1

- (1) Locate the point, Point 7, at the corner of the upper roof (intersection of the rear lateral and the longitudinal upper roof boundary) nearest to the pillar. Figure 14 illustrates the referenced locations.
- (2) Measure the distance,  $D$ , between Point 7 and the roof center, Point M, along the vehicle interior surface.
- (3) Point 8 is established by extending the line from Point M to Point 7, along the vehicle interior surface in the same vertical plane, by  $3D/7$  beyond Point 7 or until the edge of a daylight opening, whichever comes first.

## 12. COMPLIANCE TEST EXECUTION....Continued

- (4) The rearmost pillar reference point, Point RPR, is located at the midpoint of the line between Point 7 and Point 8, measured along the vehicle interior surface.

Target RP1 is located at Point RPR.



**FIGURE 14**

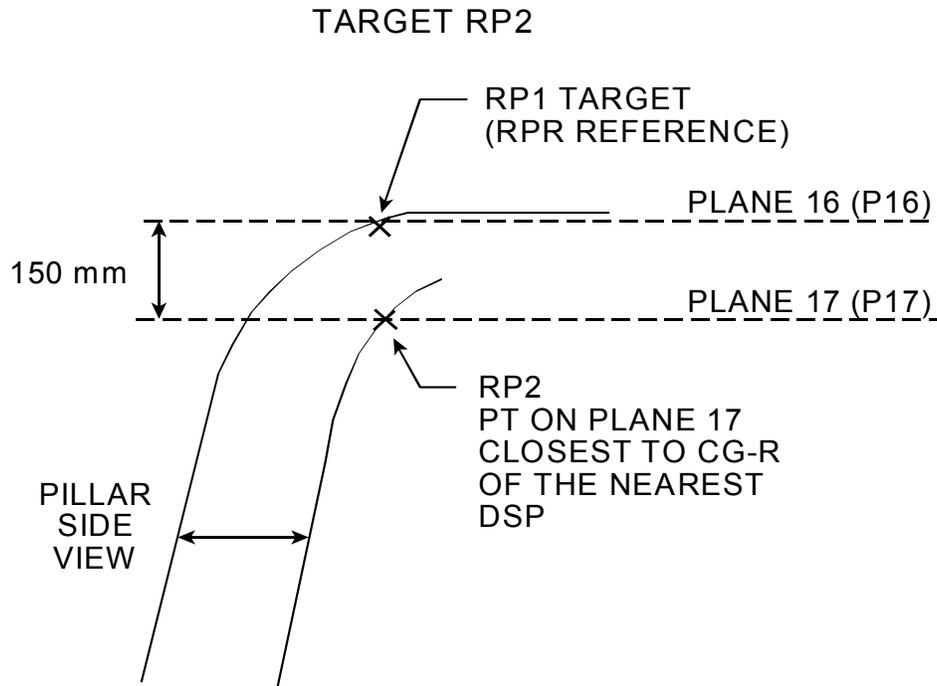
### B. Target RP2

If a seat belt anchorage is located on the pillar, Target RP2 is any point on the anchorage. For adjustable anchorages, position the anchorage midway between the two extreme adjustment positions. If the anchorage has distinct adjustment positions, none of which is midway between the two extreme positions, adjust the anchorage to the nearest position above the midpoint.

If a seat belt anchorage is NOT located on the pillar, establish Target RP2 as follows:

- (1) Locate the horizontal plane, Plane 16, through Point RPR. Figure 15 illustrates the referenced locations.
- (2) Locate the horizontal plane, Plane 17, 150 mm below Plane 16.
- (3) Target RP2 is located in Plane 17 at the rearmost pillar location closet to CG-R for the nearest DSP.

## 12. COMPLIANCE TEST EXECUTION....Continued



**FIGURE 15**

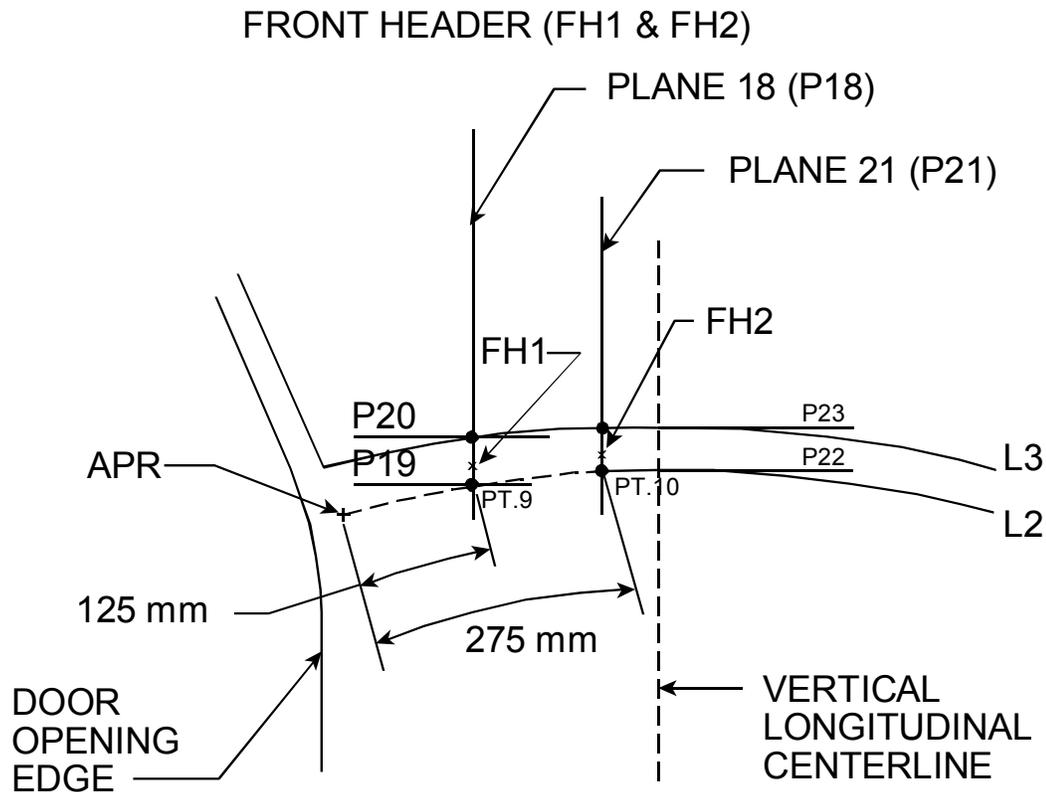
### 12.6.6 FRONT HEADER TARGETS - FH1, FH2

The test shall be conducted with the sun visor in contact with the vehicle's interior surface (windshield, side rail, front header, roof, etc.). Select the sun visor position that allows for the "worst" case impact. Figure 16 illustrates the front header target locations.

#### A. Target FH1

- (1) Contour line, Line 3, is established by the upper edge of the windshield on the vehicle interior (Figure 16).
- (2) Establish contour line on the vehicle interior trim, Line 2, parallel to Line 3 and passing through the A-pillar reference point APR.
- (3) Locate a point, Point 9, on Line 2 and 125 mm inboard of the Point APR. Measure the distance along the contour of the interior trim.
- (4) Locate a vertical longitudinal plane, Plane 18, passing through Point 9.
- (5) Locate a transverse vertical plane, Plane 19, through Point 9 through the intersection of Plane 18 and Line 2.
- (6) Locate a transverse vertical plane, Plane 20, through the intersection of Plane 18 and Line 3.

## 12. COMPLIANCE TEST EXECUTION....Continued

**FIGURE 16**

- (7) Target FH1 is located at the intersection of Plane 18 and the upper vehicle interior, half the distance between Plane 19 and Plane 20.

## B. Target FH2

If a sun roof opening is located forward of the transverse vertical plane defining the front edge of the upper roof, Target FH2 is located as specified in Section 12.6.7, Sun Roof Opening.

If a sun roof opening is NOT located forward of the front lateral edge of the upper roof, establish FH2 as follows:

- (1) Locate a point, Point 10, 275 mm inboard of Point APR along Line 2.
- (2) Locate a longitudinal vertical plane, Plane 21, through Point 10.
- (3) Locate a transverse vertical plane, Plane 22, through Point 10 through the intersection of Plane 21 and Line 2.
- (4) Locate a transverse vertical plane, Plane 23, through the intersection of Plane 21 and Line 3.

## 12. COMPLIANCE TEST EXECUTION....Continued

- (5) Target FH2 is located at the intersection of Plane 21 and the upper vehicle interior, half the distance between Plane 22 and Plane 23.

### 12.6.7 SUN ROOF OPENING - FH2

If a sun roof's interior opening is located forward of the front transverse edge of the upper roof and intersects the longitudinal vertical plane passing through the SgRP of either front outboard DSP, Target FH2 is the nearest point on the interior sun roof opening forward of CG-F2 and in the longitudinal vertical plane through the SgRP. Figure 17 illustrates FH2 on the sun roof interior opening.

The target, FH2, shall be tested with the sun roof and shade in the fully open position, if movable.

If the sun roof can not be opened and is made of a glass/glazed material, proceed with locating and marking the target location. Prior to conducting any FMH impact test of a target on glazing contact the COTR.

### 12.6.8 TARGETS ON THE SIDE RAIL BETWEEN THE A-PILLAR AND THE B-PILLAR (or REARMOST PILLAR) -SR1, SR2

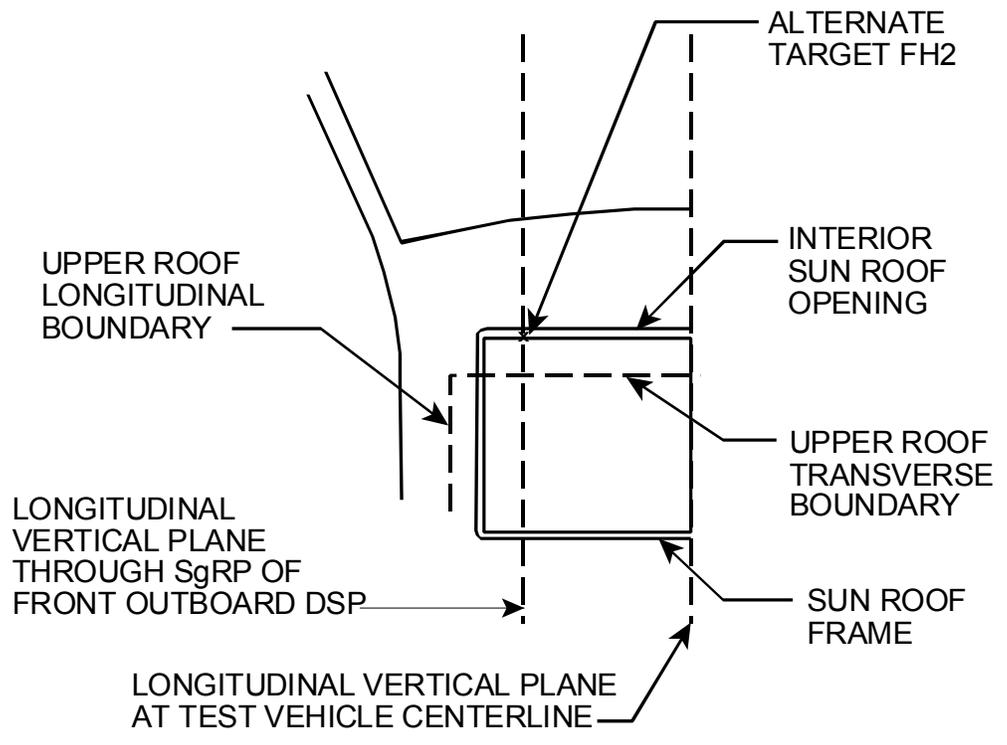
The test can be conducted with the sun visor in contact with the vehicle's interior surface (windshield, side rail, front header, roof, etc.) The COTR will provide instructions as to the sun visor's position. Figure 18 illustrates the side rail target locations.

#### A. Target SR1

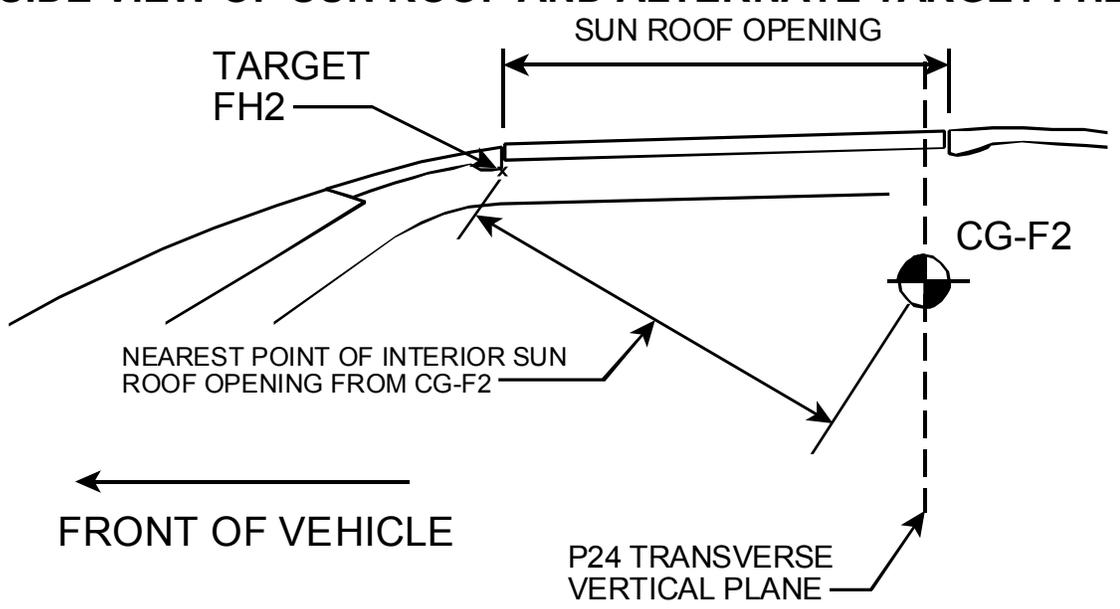
- (1) Locate a transverse vertical plane, Plane 25, 150 mm rearward of the A-pillar reference point, Point APR.
- (2) Locate the point, Point 11, at the intersection of Plane 25 and the upper edge of the forwardmost door opening.
- (3) Locate the point, Point 12, at the intersection of Plane 25 and the plane defining the nearest longitudinal edge of the upper roof at the surface of the vehicle ceiling.
- (4) Target SR1 is located at the middle of the line between Point 11 and Point 12 in Plane 25, measured along the vehicle interior.

12. COMPLIANCE TEST EXECUTION....Continued

**TOP VIEW OF SUN ROOF AND ALTERNATE TARGET FH2**



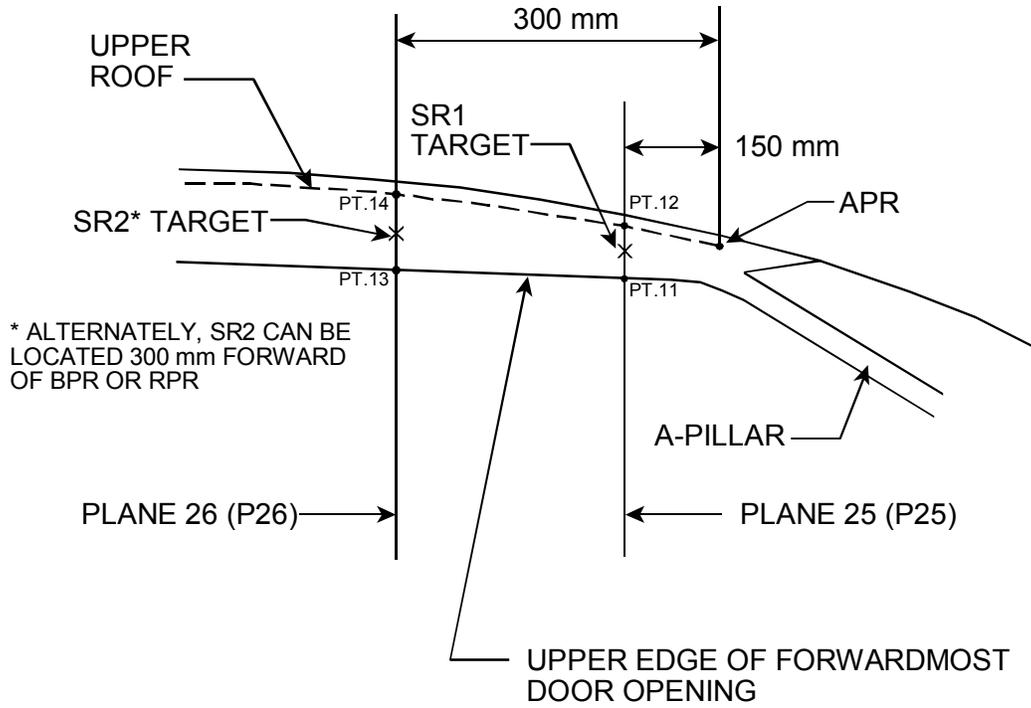
**SIDE VIEW OF SUN ROOF AND ALTERNATE TARGET FH2**



**FIGURE 17**

## 12. COMPLIANCE TEST EXECUTION....Continued

### TARGETS ON SIDE RAIL BETWEEN A-PILLAR & B-PILLAR



#### B. Target SR2

- (1) Locate a transverse vertical plane, Plane 26, 300 mm rearward of APR or 300 mm forward of the BPR (or RPR if the B-pillar is also the rearmost pillar - ex. Pickup).
- (2) Locate the point, Point 13, at the intersection of Plane 26 and the upper edge of the forwardmost door opening.
- (3) Locate the point, Point 14, at the intersection of Plane 26 and the nearest longitudinal edge of the upper roof at the interior roof surface.
- (4) Target SR2 is located at the middle of the line between Point 13 and Point 14 in Plane 26, measured along the vehicle interior.

## 12. COMPLIANCE TEST EXECUTION....Continued

### 12.6.9 OTHER SIDE RAIL TARGET - SR3

If a seat belt anchorage is located on the side rail, Target SR3 is located at any point on the anchorage. For adjustable anchorages, position the anchorage midway between the two extreme adjustment positions. If the anchorage has distinct adjustment positions, none of which is midway between the two extreme positions, adjust the anchorage to the nearest position above the midpoint.

If a seat belt anchorage is NOT located on the side rail and a grab-handle is located on the side rail, Target SR3 is located on the anchorage of the grab-handle. Folding grab-handles are in their stowed position for testing.

If neither a seat belt anchorage nor a grab-handle is located on the side rail, establish Target SR3 as follows:

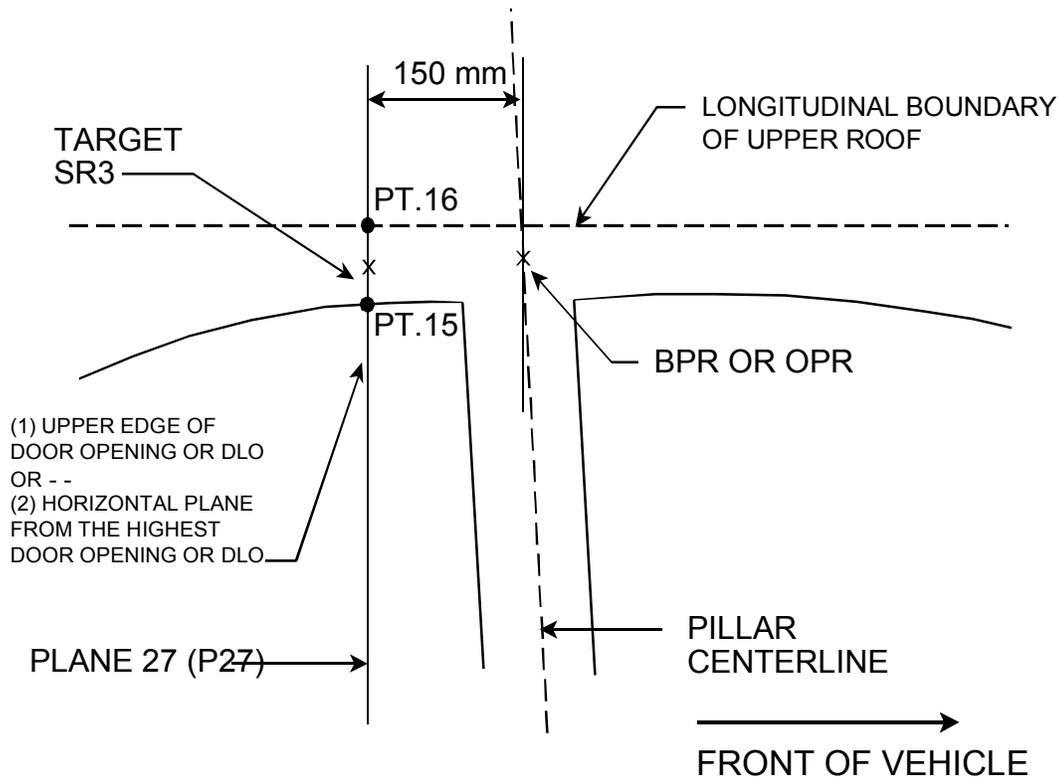
- A. Locate a transverse vertical plane, Plane 27, 150 mm rearward of BPR, B-pillar reference point, or OPR, Other pillar reference point. Figure 19 illustrates the referenced locations.
- B. Locate the point, Point 16, at the intersection of Plane 27 and the plane defining the nearest longitudinal edge of the upper roof at the vehicle ceiling surface.
- C.
  - (1) If Plane 27 intersects a door or daylight opening:  
  
Point 15 is located at the intersection of Plane 27 and the upper edge of the door opening or daylight opening.
  - (2) If Plane 27 does not intersect a door or daylight opening:  
  
Point 15 is located on the vehicle interior at the intersection of Plane 27 and the horizontal plane through the highest point of the nearest door or daylight opening.  
  
If the adjacent door(s) or daylight opening(s) are equidistant to Plane 27:  
  
Point 15 is located on the vehicle interior at the intersection of Plane 27 and either horizontal plane through the highest point of the respective door or daylight opening.
- D. Target SR3 is located at the middle of the line between Point 15 and Point 16 in Plane 27, measured along the vehicle interior.

## 12. COMPLIANCE TEST EXECUTION....Continued

### 12.6.10 REAR HEADER TARGET - RH

- A. Locate the point, Point 17, at the intersection of the surface of the upper vehicle interior, the longitudinal vertical plane, Plane 28, through the SgRP for the rearmost outboard DSP and the transverse vertical plane defining the rear edge of the upper roof. Figure 20 illustrates the rear header target location.
- B. (1) If Plane 28 intersects a rear door opening or daylight opening:  
Point 18 is located at the intersection of Plane 28 and the upper edge of the door opening or the daylight opening if no door opening.
- (2) If Plane 28 does NOT intersect a rear door opening or daylight opening:  
Point 18 is located on the vehicle interior at the intersection of Plane 28 and a horizontal plane through the highest point of the door or daylight opening nearest to Plane 28.

### OTHER SIDE RAIL TARGET



**FIGURE 19**

## 12. COMPLIANCE TEST EXECUTION....Continued

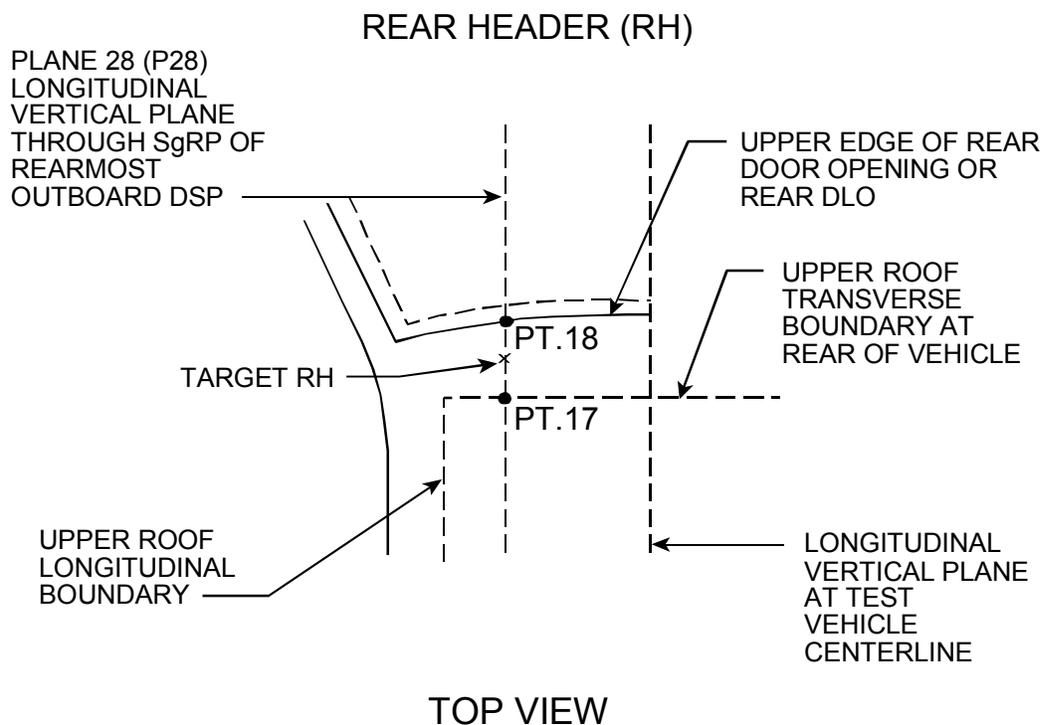
If the adjacent door(s) or daylight opening(s) are equidistant to Plane 28:

Point 18 is located on the vehicle interior at the intersection of Plane 28 and either horizontal plane through the highest point of each door or daylight opening.

- C. Target RH is located at the middle of the line between Point 17 and Point 18, in Plane 28, measured along the vehicle interior.
- D. If Target RH is more than 112 mm from Point 18 on the line between Point 17 and Point 18 and is in Plane 28, Target RH is the point on that line 112 mm from Point 18.

### 12.6.11 SLIDING DOOR TRACK TARGET - SD

- A. Determine the distance, MM, at the widest opening of the sliding door. The distance is measured horizontally and parallel to the vehicle longitudinal centerline. Figure 21 illustrates the sliding door track target location.
- B. Locate the transverse vertical plane, Plane 29, passing through the middle of the widest opening of the sliding door (MM/2).



**FIGURE 20**

## 12. COMPLIANCE TEST EXECUTION....Continued

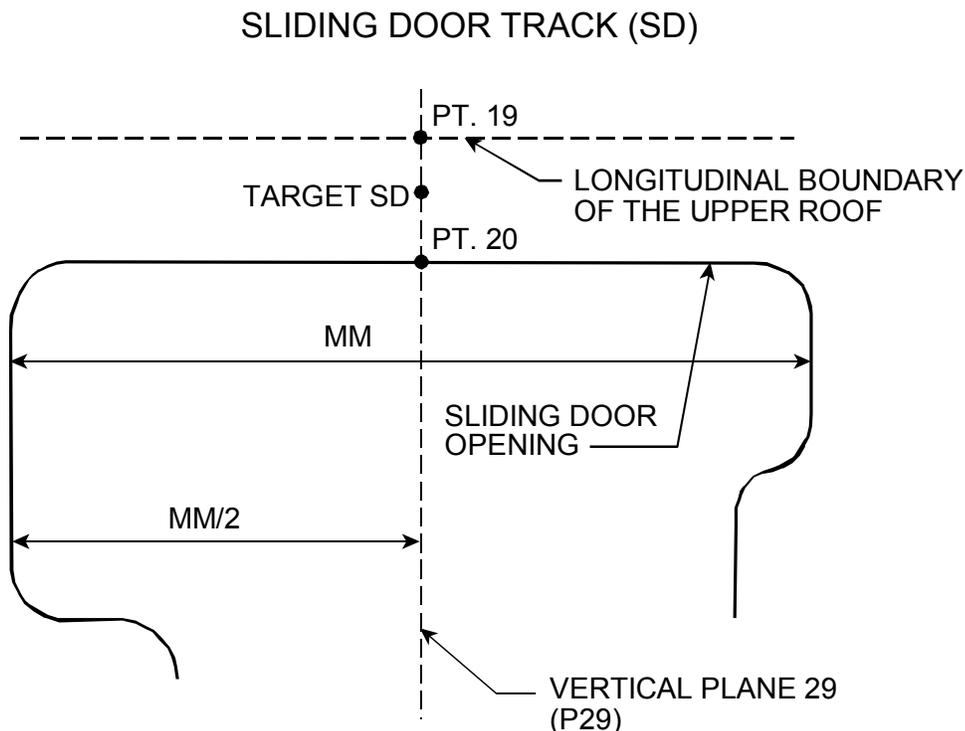
- C. Locate the point, Point 19, at the intersection of the surface of the upper vehicle interior, Plane 29, and the plane defining the nearest longitudinal edge of the upper roof.
- D. Locate the point, Point 20, at the intersection of Plane 29 and the upper edge of the sliding door opening.
- E. Target SD is located at the middle of the line between Point 19 and Point 20 in Plane 29, measured along the vehicle interior.

### 12.6.12 ROLL-BAR TARGET - RB1, RB2

Establish Target RB1 as follows:

- A. Locate a longitudinal vertical plane, Plane 30, through the SgRP of the outboard DSP. Figure 22 illustrates the roll-bar target location.
- B. Target RB1 is located on the roll-bar and in Plane 30 at the location closest to CG-F2 (front outboard DSP) or CG-R (rear outboard DSP), as appropriate.

If a seat belt anchorage is located on the roll-bar, Target RB2 is any point on the anchorage. For adjustable anchorages, position the anchorage midway between the two extreme adjustment positions. If the anchorage has distinct adjustment positions, none of which is midway between the two extreme positions, adjust the anchorage to the nearest position above the midpoint.



**FIGURE 21**

## 12. COMPLIANCE TEST EXECUTION....Continued

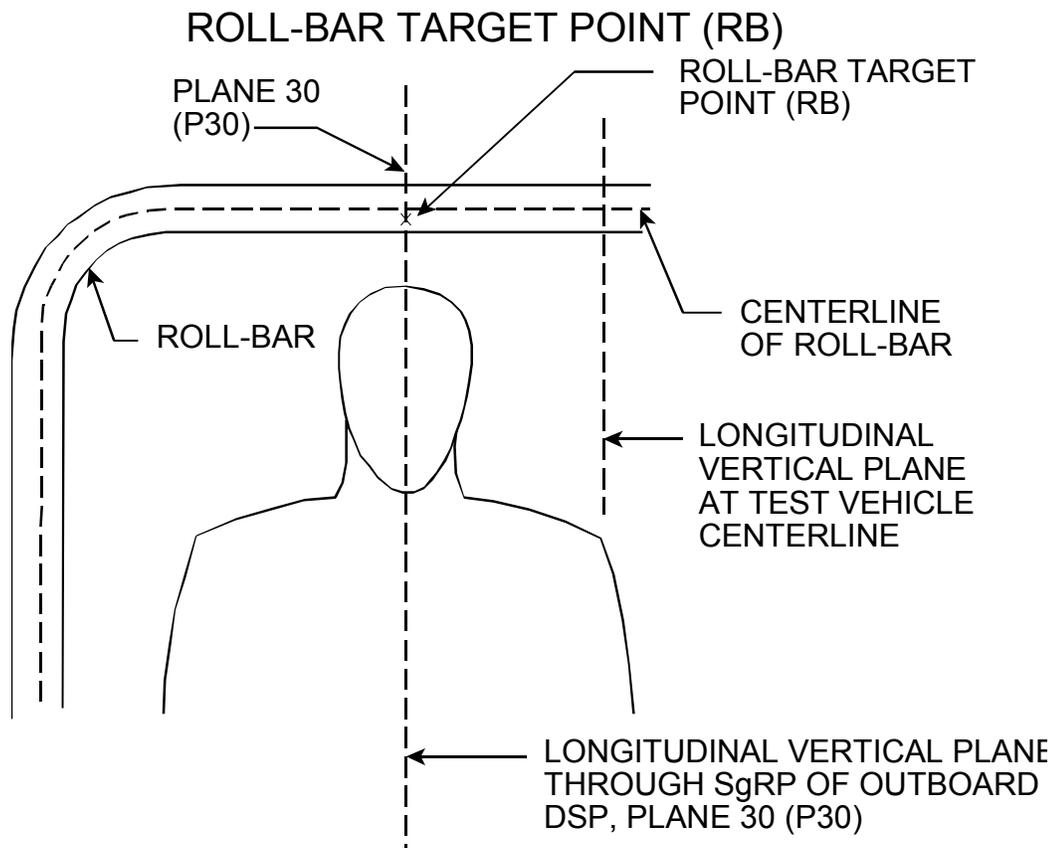
The definition of roll-bar does not include deployable roll-bars. There are no targets on a deployable roll-bar.

### 12.6.13 STIFFENER TARGET - ST1, ST2

Establish Target ST1 as follows:

- A. Locate a transverse vertical plane, Plane 31, containing CG-F2 or CG-R, as appropriate, for any outboard designated seating position. Figure 23 illustrates the stiffener target location.
- B. Target ST is located on the stiffener in Plane 31 at the location closest to CG-F2 or CG-R, as appropriate.

If a seat belt anchorage is located on the stiffener, Target ST2 is any point on the anchorage. For adjustable anchorages, position the anchorage midway between the two extreme adjustment positions. If the anchorage has distinct adjustment positions, none of which is midway between the two extreme positions, adjust the anchorage to the nearest position above/beyond the midpoint.



**FIGURE 22**

12. COMPLIANCE TEST EXECUTION....Continued

STIFFENER TARGET (ST)

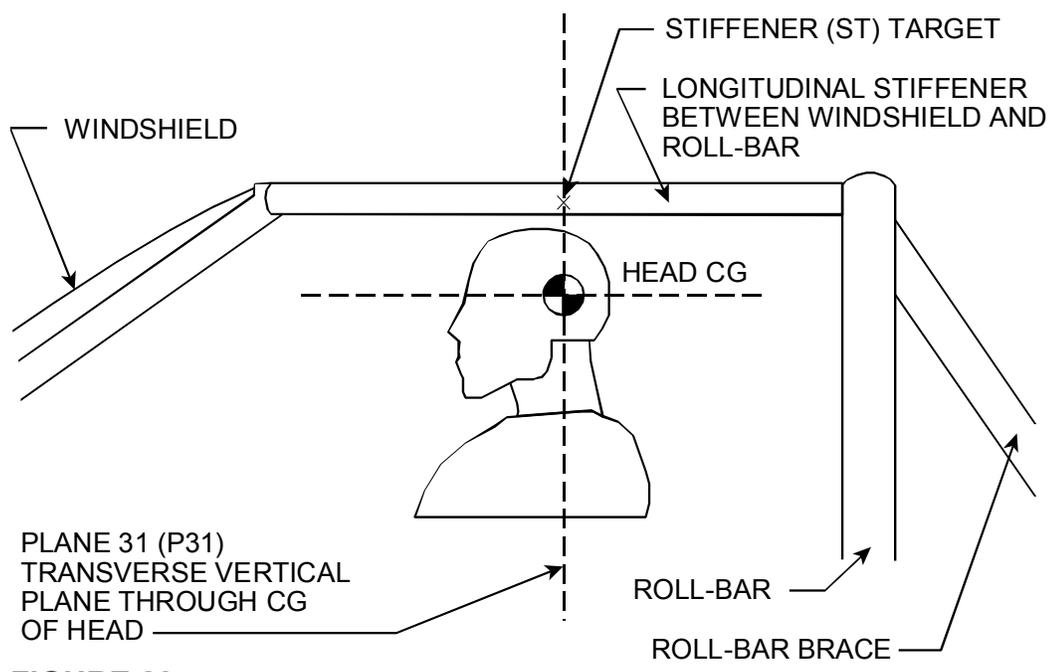
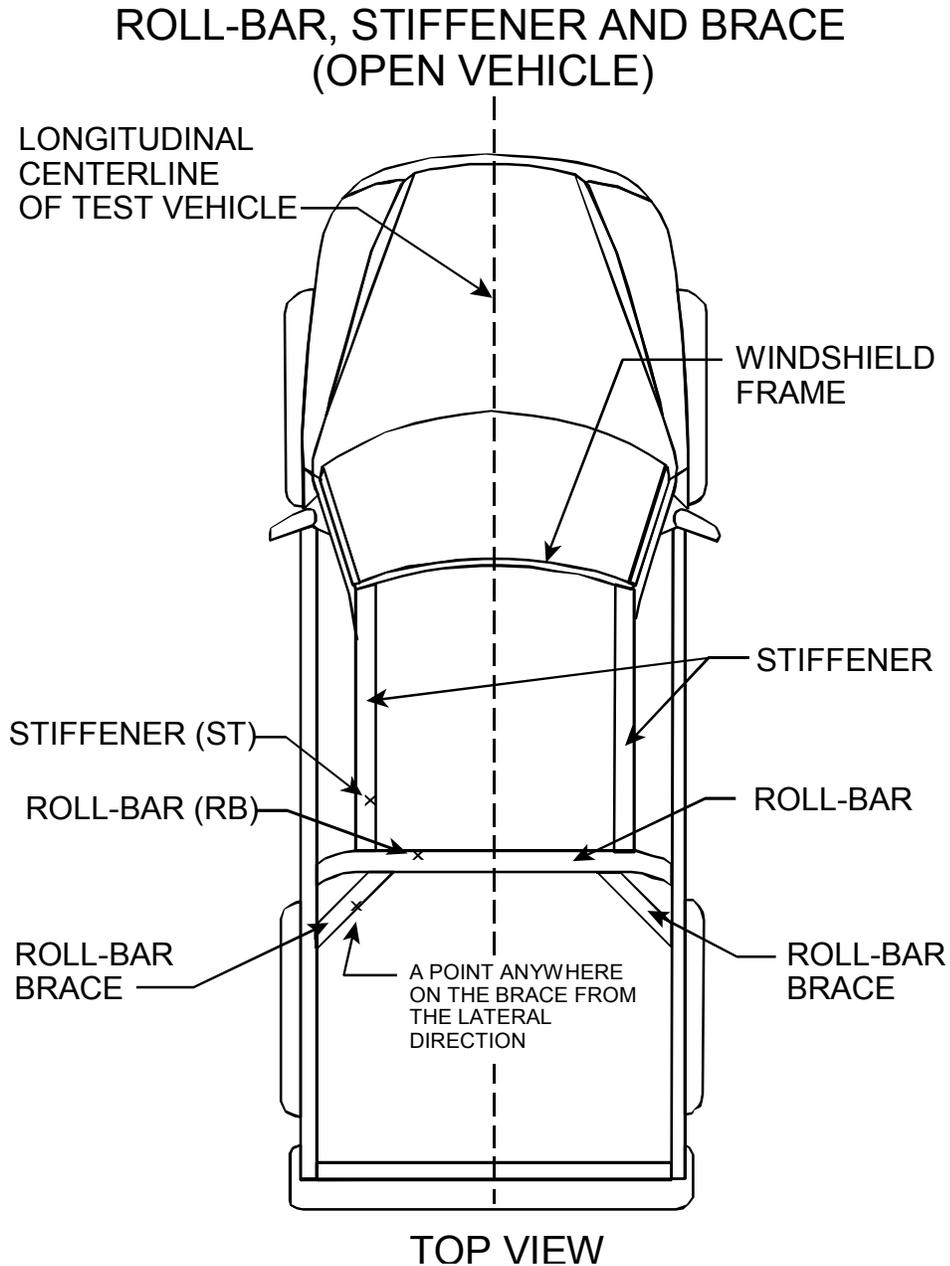


FIGURE 23

12.6.15 BRACE TARGET - BT

Target BT is any point on the width of the brace as viewed laterally from inside the passenger compartment.

## 12. COMPLIANCE TEST EXECUTION....Continued



## 12.7 VERTICAL APPROACH ANGLES

The vertical approach angle is the angle between the horizontal plane and the velocity vector, measured in the midsagittal plane of the FMH. A  $0^\circ$  vertical vector coincides with the horizontal plane and a vertical vector greater than  $0^\circ$  makes an upward angle of the same number of degrees. Figure 25 illustrates the vertical approach angle plane.

## 12. COMPLIANCE TEST EXECUTION....Continued

### 12.7.1 Vertical Approach Angles for A-Pillars

The minimum vertical approach angle for A-pillars is  $-5^{\circ}$ . Determine the maximum vertical approach angle as follows:

- A. Position the forehead impact zone in contact with the selected A-pillar target at the prescribed horizontal approach angle. If a range of horizontal approach angles is prescribed, position the forehead impact zone in contact with the selected target at any horizontal approach angle within the range.
- B. Keeping the forehead impact zone in contact with the A-pillar target, rotate the FMH upward until the lip, chin or other part of the FMH contacts the component or other portion of the vehicle interior.

Keeping the forehead impact zone in contact with the target, rotate the FMH downward by  $5^{\circ}$  to determine the maximum vertical angle.

The maximum vertical approach angle is the resultant angle within the established range in Table 1, Approach Angle Limits. The maximum vertical approach angle specified in Table 1 is  $50^{\circ}$ .

If the FMH forehead impact zone can NOT contact the target within the combination of horizontal and vertical angles:

Move the target center to any location within a 25 mm radius of the original target center.

Increase the radius of the original target center in increments of 25 mm until at least one point can be contacted by the FMH forehead impact zone at one or more combination of angles.

- I. Record the maximum vertical approach angle.

### 12.7.2 Vertical Approach Angles for B-Pillars, Other Pillars and Rearmost Pillars

The minimum vertical approach angle for B-pillars, other pillars and rearmost pillars is  $-10^{\circ}$ . Determine the maximum vertical approach angle as follows:

- A. Position the forehead impact zone in contact with the selected pillar target at the prescribed horizontal approach angle. If a range of horizontal approach angles is prescribed, position the forehead impact zone in contact with the selected target at any horizontal approach angle within the range.

12. COMPLIANCE TEST EXECUTION....Continued

# VERTICAL APPROACH ANGLE PLANE

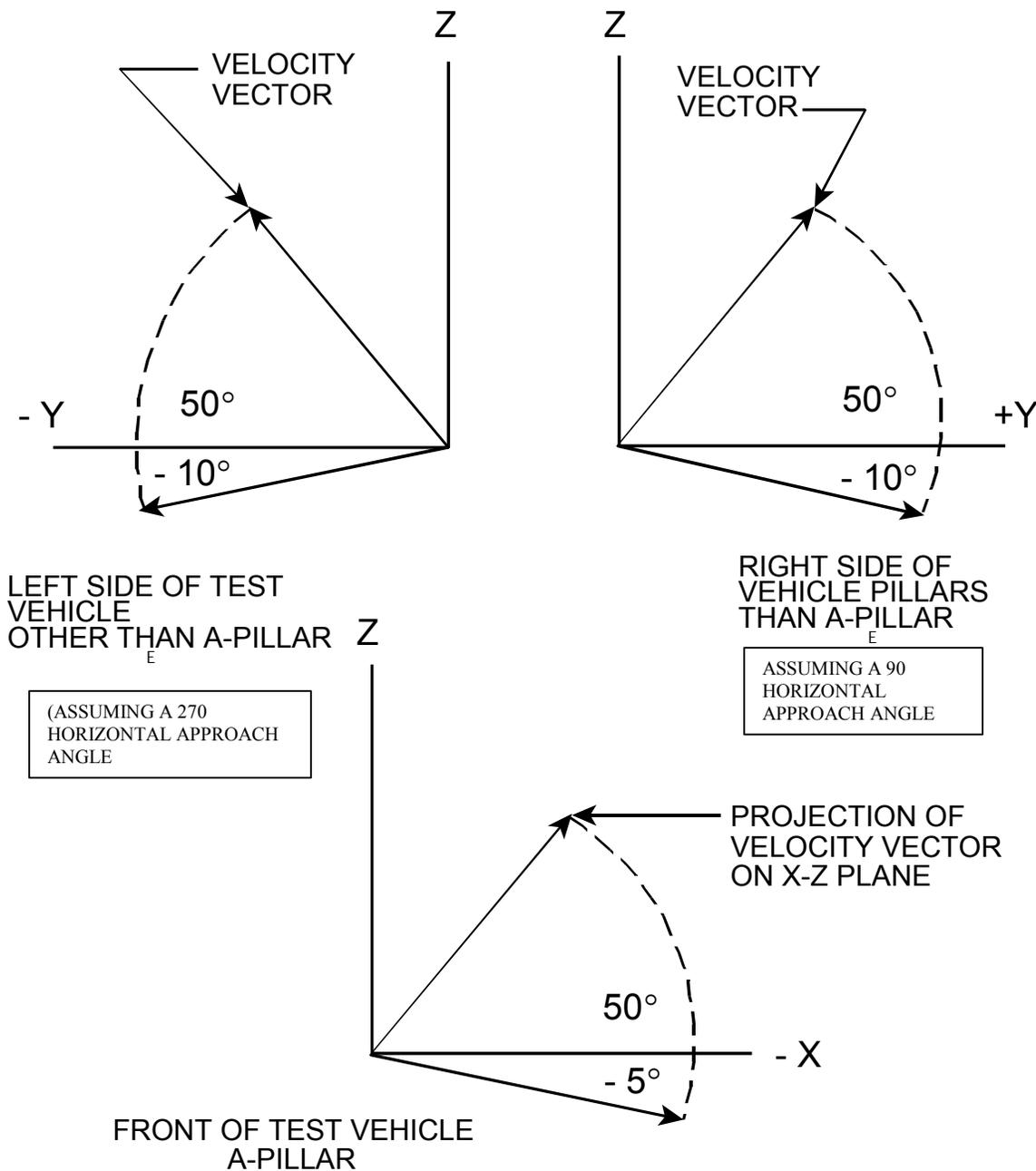


FIGURE 25

## 12. COMPLIANCE TEST EXECUTION....Continued

- B. Keeping the forehead impact zone in contact with the pillar target, rotate the FMH upward until the lip, chin or other part of the FMH contacts the component or other portion of the vehicle interior.

Keeping the forehead impact zone in contact with the target, rotate the FMH downward by 10° to determine the maximum vertical angle.

The maximum vertical approach angle is the resultant angle within the established range in Table 1, Approach Angle Limits. The maximum vertical approach angle specified in Table 1 is 50°.

If the FMH forehead impact zone can NOT contact the target within the combination of horizontal and vertical angles:

Move the target center to any location within a 25 mm radius of the original target center measuring.

Increase the radius in increments of 25 mm until at least one point can be contacted by the FMH forehead impact zone at one or more combination of angles.

- C. Record maximum vertical approach angle.

### 12.7.3 Vertical Approach Angles for Other Components (Headers, Side Rails, Roof, Brace, Stiffener and Seat Belt Anchorages)

The minimum vertical approach angle for the other components is 0°. Determine the maximum vertical approach angle as follows:

- A. Position the forehead impact zone in contact with the selected target at the prescribed horizontal approach angle. If a range of horizontal approach angles is prescribed, position the forehead impact zone in contact with the selected target at any horizontal approach angle within the range.
- B. Keeping the forehead impact zone in contact with the target, rotate the FMH upward until the lip, chin or other part of the FMH contacts the component or other portion of the vehicle interior.

Keeping the forehead impact zone in contact with the target, rotate the FMH downward by 5° to determine the maximum vertical angle.

The maximum vertical approach angle is the resultant angle within the established range in Table 1, Approach Angle Limits. The maximum vertical approach angle specified in Table 1 is 50°.

## 12. COMPLIANCE TEST EXECUTION....Continued

If the FMH forehead impact zone can NOT contact the target within the combination of horizontal and vertical angles:

Move the target center to any location within a 25 mm radius of the original target center.

Increase the radius in increments of 25 mm until at least one point can be contacted by the FMH forehead impact zone at one or more combination of angles.

C. Record maximum vertical approach angle.

### 12.8 FMH IMPACT TEST EXECUTION

#### 12.8.1 PRE-IMPACT CONDITIONS

- A. Movable vehicle windows are placed in the fully open position for targeting and testing.
- B. The top, if any, of convertibles and open-body type vehicles is in the closed passenger compartment configuration for targeting and testing.
- C. Any side door on the opposite side of the vehicle longitudinal centerline from the target may be open or removed during testing.

Any rear hatchback or tailgate may be open or removed for testing any target except targets on the rear header, rearmost pillars, or the rearmost other side rail (on either side of the vehicle) for testing. Prior to removal of any vehicle door or hatchback, contact the COTR for approval.

Any other doors are fully closed and latched but not locked during testing .

- D. Each sun visor is:

Placed in any position where one side of the visor is in contact with the vehicle interior surface (windshield, side rail, front header, roof, etc.)

Select the sun visor position that allows for the "worst" case impact.

- E. The steering wheel may be placed in any position intended for use while the vehicle is in motion during targeting.

The steering wheel may be removed from the vehicle for testing.

## 12. COMPLIANCE TEST EXECUTION....Continued

- F. The seats may be placed in any position intended for use while the vehicle is in motion during targeting.
- The seats may be removed from the vehicle after target points are identified and relocated, where necessary, for testing.
- G. Seat belt anchorages:
- (1) If a target is on a seat belt anchorage (ie. BP2, OP1, RP2, SR3, RB2, ST2) and if the seat belt anchorage is adjustable, tests are conducted with the anchorage adjusted to a point midway between the two extreme adjustment positions.
  - (2) If a target is on a seat belt anchorage and the anchorage has distinct adjustment positions, none of which is midway between the two extreme positions, tests are conducted with the anchorage adjusted to the nearest position above/beyond the midpoint of the two extreme positions.
  - (3) If the seat belt anchorage is not a specified target, the seat belt anchorage may be adjusted in any position to target or test the component.
- I. Movable attachments, unless otherwise specified, may be moved to any position for the purpose of targeting and testing.
- I. If the FMH forehead impact zone can NOT contact the target within the combination of horizontal and vertical angles:
- (1) Move the target center to any location within a 25 mm radius of the original target center.
  - (2) Increase the radius in increments of 25 mm until at least one point can be contacted by the FMH forehead impact zone at one or more combination of angles.
- J. The target must be marked with a solid 12.7 mm diameter circle using any transferable opaque medium.
- K. The FMH used must meet the specifications of Appendix A, Part 572L Free Motion Headform Performance Calibration Test Procedure.
- L. The ambient temperature is between 19°C and 26°C at any relative humidity between 10% and 70%. Tests are NOT conducted unless the FMH and test vehicle are exposed to the conditions specified for a period not less than four hours.

## 12. COMPLIANCE TEST EXECUTION....Continued

- M. Allow at least 3 hours between successive tests on the same headform.

### 12.8.2 IMPACT TESTS

- A. For each target, position the FMH at the horizontal and vertical impact angle appropriate for the component. Record the horizontal and vertical impact angle.

The FMH can be launched from any location inside the vehicle. At the time of launch, verify that the midsagittal plane of the headform is vertical and the headform upright. The FMH must travel freely through the air, along a velocity vector perpendicular to the headform's skull cap plate, not less than 25 mm before contacting the component. During the initial contact, the forehead impact zone must contact the target circle.

- B. Photograph the pretest setup as required.
- C. Record the temperature immediately prior to conducting the impact test.
- D. Conduct a pretest instrumentation check.
- E. Impact each target with the FMH at  $23.6 \text{ kph} \pm 0.3 \text{ kph}$ .
- F. Record and process the acceleration time data, take the necessary post test photographs documenting the forehead impact zone contact, component condition, process and edit high speed film, etc.
- G. After each impact test, visually inspect the FMH forehead impact zone for any contact mark(s) documenting FMH contact with the target circle. Record on laboratory check-off sheet and document the contact with photography.
- H. After each impact test, visually inspect the tested vehicle component for visible damage. Document the damaged area with photography and a written description.
- I. Visually inspect the head skin for cracks, cuts, abrasions, etc. Repair or replace the head skin if the damaged area is more than superficial. Document the damaged area with photography and a post test calibration test before replacement or repairs are made.
- J. Review the vehicle test film to verify the initial contact location between the FMH and the vehicle component.

## **12. COMPLIANCE TEST EXECUTION....Continued**

### **12.8.3 MULTIPLE IMPACTS**

A test vehicle component may be impacted multiple times subject to the following:

- A. Impacts within 300 mm may not occur less than 30 minutes apart.
- B. No impacts within 150 mm of any other impact.
- C. The distance between impacts is measured from the center of the target circles and along the vehicle interior.

## **13. POST TEST REQUIREMENTS**

The contractor shall verify all instrumentation, check data sheets, high speed film, photographs and conduct post test P572L calibration(s). The test data, photographs, test film, etc. must be reviewed prior to submitting the final report to assure that all test conditions have been met. Any anomalies shall be identified and explained in the final test report. Data must be recorded in all data blocks on every test data sheet.

## **14. REPORTS**

### **14.1 MONTHLY STATUS REPORTS**

The contractor shall submit a Monthly Test Status Report and a Vehicle or Equipment Status Report to the COTR (both reports shown in the FORMS Section 16). The Vehicle Status Report shall be submitted until all vehicles or items of equipment are disposed of.

### **14.2 APPARENT TEST FAILURE**

Any indication of an apparent test failure shall be communicated by telephone to the COTR within 24 hours with written notification mailed within 48 hours (Saturdays and Sundays excluded). A Notice of Apparent Test Failure, shown in the FORMS Section 16, with a copy of the particular compliance test data sheet(s) and preliminary data plot(s) shall be included.

In the event of an apparent test failure, a post test calibration check of some critically sensitive test equipment and instrumentation may be required for verification of accuracy. The necessity for the calibration shall be at the COTR's discretion and shall be performed without additional costs to the OVSC.

## 14. REPORTS...Continued

### 14.3 FINAL TEST REPORT

#### 14.3.1 COPIES

In the case of a test failure or retest (another test of a vehicle that exceeded the FMVSS 201U performance requirements), **SEVEN** copies of the Final Test Report, **FOUR** copies of the test film, **TWO** copies of the FMH calibrations, **TWO** copies of the data tape, and **ONE** copy of the test check sheets shall be submitted to the COTR for acceptance within three weeks of test completion. The Final Test Report format to be used by all contractors can be found in this section.

Where there has been no indication of a test failure, **FIVE** copies of each Final Test Report, **THREE** copies of the test film, **ONE** copy of the FMH calibrations, **ONE** copy of the data tape, and **ONE** copy of the test check sheets shall be submitted to the COTR within three weeks of test completion. Payment of contractor's invoices for completed compliance tests may be withheld until the Final Test Report is accepted by the COTR. Contractors are requested to NOT submit invoices before the COTR is provided copies of the Final Test Report.

Contractors are required to submit the first Final Test Report in draft form within two weeks after the compliance test is conducted. The contractor and the COTR will then be able to discuss the details of both test conduct and report content early in the compliance test program. Contractors are required to PROOF READ all Final Test Reports before submittal to the COTR. The OVSC will not act as a report quality control office for contractors. Reports containing a significant number of errors will be returned to the contractor for correction, and a "hold" will be placed on invoice payment for the particular test.

#### 14.3.2 REQUIREMENTS

The Final Test Report, associated documentation (including photographs) are relied upon as the chronicle of the compliance test. The Final Test Report will be released to the public domain after review and acceptance by the COTR. For these reasons, each final report must be a complete document capable of standing by itself.

The contractor should use **detailed** descriptions of all compliance test events. Any events that are not directly associated with the standard but are of technical interest should also be included. The contractor should include as much detail as possible in the report.

Instructions for the preparation of the first three pages of the final test report are provided below for the purpose of standardization.

## 14. REPORTS...Continued

### 14.3.3 FIRST THREE PAGES

#### FRONT COVER

A heavy paperback cover (or transparency) shall be provided for the protection of the final report. The information required on the cover is as follows:

- A. Final Report Number such as 201U-ABC-9X-001, where –

201U is the FMVSS tested

ABC are the initials for the laboratory

9X is the Fiscal Year of the test program (or 0X after 1999)

001 is the Group Number (001 for the 1st test, 002 for the 2nd test, 003 for the 3rd test, etc.)

- B. Final Report Title And Subtitle such as

SAFETY COMPLIANCE TESTING FOR FMVSS 201U  
Occupant Protection In Interior Impact  
Upper Interior Head Impact Protection  
\*\*\*\*\*

World Motors Corporation

199X XYZ 4-door sedan

NHTSA No. CX0401

- C. Contractor's Name and Address such as

ABC LABORATORIES, INC.

405 Main Street

Detroit, Michigan 48070

**NOTE:** DOT SYMBOL WILL BE PLACED BETWEEN ITEMS (C) AND (D)

- D. Date of Final Report completion

- E. The words "FINAL REPORT"

- F. The sponsoring agency's name and address as follows

U. S. DEPARTMENT OF TRANSPORTATION

National Highway Traffic Safety Administration

Safety Assurance

Office of Vehicle Safety Compliance

Mail Code: NSA-30, Room 6115

400 Seventh Street, SW

Washington, DC 20590

**14. REPORTS....Continued**

FIRST PAGE AFTER FRONT COVER

A disclaimer statement and an acceptance signature block for the COTR shall be provided as follows:

This publication is distributed by the U.S. Department of Transportation, National Highway Traffic Safety Administration, in the interest of information exchange. The opinions, findings and conclusions expressed in this publication are those of the author(s) and not necessarily those of the Department of Transportation or the National Highway Traffic Safety Administration. The United States Government assumes no liability for its contents or use thereof. If trade or manufacturers' names or products are mentioned, it is only because they are considered essential to the object of the publication and should not be construed as an endorsement. The United States Government does not endorse products or manufacturers.

Prepared By: \_\_\_\_\_

Approved By: \_\_\_\_\_

Approval Date: \_\_\_\_\_

FINAL REPORT ACCEPTANCE BY OVSC:

Accepted By: \_\_\_\_\_

Acceptance Date: \_\_\_\_\_

**14. REPORTS....Continued**

## SECOND PAGE AFTER FRONT COVER

A completed Technical Report Documentation Page (Form DOT F1700.7) shall be completed for those items that are applicable with the other spaces left blank. Sample data for the applicable block numbers of the title page follows.

## Block 1 — REPORT NUMBER

201U-ABC-9X-001

## Block 2 — GOVERNMENT ACCESSION NUMBER

Leave blank

## Block 3 — RECIPIENT'S CATALOG NUMBER

Leave blank

## Block 4 — TITLE AND SUBTITLE

Final Report of FMVSS 201U Compliance Testing  
of a 199X World XYZ 4-door sedan  
NHTSA No. CX0401

## Block 5 — REPORT DATE

March 1, 199X

## Block 6 — PERFORMING ORGANIZATION CODE

ABC

## Block 7 — AUTHOR(S)

John Smith, Project Manager  
Bill Doe, Project Engineer

## Block 8 — PERFORMING ORGANIZATION REPORT NUMBER

ABC-DOT-XXX-001

**14. REPORTS....Continued****Block 9 — PERFORMING ORGANIZATION NAME AND ADDRESS**

ABC Laboratories, Inc.  
405 Main Street  
Detroit, MI 48070

**Block 10 — WORK UNIT NUMBER**

Leave blank

**Block 11 — CONTRACT OR GRANT NUMBER**

DTNH22-9X-C-12345

**Block 12 — SPONSORING AGENCY NAME AND ADDRESS**

US Department of Transportation  
National Highway Traffic Safety Administration  
Safety Assurance  
Office of Vehicle Safety Compliance  
Mail Code: NSA-30  
400 Seventh Street, SW, Room 6115  
Washington, DC 20590

**Block 13 — TYPE OF REPORT AND PERIOD COVERED**

Final Test Report  
March 7 to March 15, 199X

**Block 14 — SPONSORING AGENCY CODE**

NSA-30

**Block 15 — SUPPLEMENTARY NOTES**

Leave blank

**Block 16 — ABSTRACT**

Compliance tests were conducted on the subject 199X World XYZ 4-door sedan in accordance with the specifications of the Office of Vehicle Safety Compliance Test Procedure No. TP-201U-XX for the determination of FMVSS 201U compliance. Test failures identified were as follows:

None (or, if any, describe)

**14. REPORTS...Continued**

## Block 17 — KEY WORDS

Compliance Testing  
Safety Engineering  
FMVSS 201U

## Block 18 — DISTRIBUTION STATEMENT

Copies of this report are available from the following:

NHTSA Technical Information Services (TIS)  
Mail Code: NAD-40  
400 Seventh St., SW, Room 5108  
Washington, DC 20590  
Telephone No. 202-366-4946

## Block 19 — SECURITY CLASSIFICATION OF REPORT

Unclassified

## Block 20 — SECURITY CLASSIFICATION OF PAGE

Unclassified

## Block 21 — NUMBER OF PAGES

Add appropriate number

## Block 22 — PRICE

Leave blank

## **14. REPORTS....Continued**

### 14.3.4 TABLE OF CONTENTS

Sample Test Report Table of Contents:

Section 1 — Purpose of Compliance Test

Section 2 — Compliance Data Summary

Section 3 — Test Data (including acceleration and velocity plots)

Section 4 — Test Equipment List and Calibration Information

Section 5 — Photographs

Section 6 — Notice of Test Failure (if applicable)

## 14. REPORTS....Continued

### 14.3.5 SAMPLE TEST REPORT INFORMATION

#### SAMPLE LIST OF TABLES

TABLE	DESCRIPTION	PAGE NO.
1	Test Summary	
2	General Test and Vehicle Parameter Data	
3	Post Impact Data	
4	Acceleration Data Plots	
5	Test Vehicle Failure Notice	

#### PURPOSE AND SUMMARY OF TEST FOR VEHICLE NO. CX0401

**PURPOSE** The purpose of this head impact compliance test was to determine whether the subject vehicle, a 199X World XYZ 4-door sedan, meets the performance requirements of FMVSS 201U, Occupant Protection in Interior Impact — Upper Interior Head Impact Protection. The compliance test was conducted using the requirements found in the OVSC Laboratory Test Procedure No. TP-201U-OX dated \_\_\_\_\_.

**SUMMARY** The 199X World XYZ 4-door sedan was equipped with deluxe (SE) interior trim along with a manual sunroof extending across the front occupant seating area. The test vehicle appeared to comply with the performance requirements of FMVSS 201U. The HIC(d) measured using the Part 572L (Free Motion Headform) headform was below 1,000 for each tested component.

## 15. DATA SHEETS

DATA SHEET 1  
TEST RESULTS SUMMARY

VEHICLE NHTSA NO.: \_\_\_\_\_ VIN: \_\_\_\_\_

MAKE/MODEL/BODY STYLE: \_\_\_\_\_

TARGET (x,y,z)	HORIZONTAL IMPACT ANGLE X°	VERTICAL IMPACT ANGLE Z°	VELOCITY (KPH)	FMH HIC	HIC(d)
<b>A-PILLARS</b>					
AP1 (.,.,.)					
AP2 (.,.,.)					
AP3 (.,.,.)					
<b>B-PILLARS</b>					
BP1 (.,.,.)					
BP2 (.,.,.)					
BP3 (.,.,.)					
BP4 (.,.,.)					
<b>OTHER PILLARS</b>					
OP1 (.,.,.)					
OP2(.,.,.)					
<b>REARMOST PILLARS</b>					
RP1 (.,.,.)					
RP2 (.,.,.)					
<b>FRONT HEADER</b>					
FH1 (.,.,.)					
FH2 (.,.,.)					
RH (.,.,.)					
<b>SIDE RAIL</b>					
SR1 (.,.,.)					
SR2 (.,.,.)					
SR3 (.,.,.)					
<b>REAR HEADER</b>					
RH (.,.,.)					
<b>UPPER ROOF</b>					
UR (.,.,.)					

(Continued on next page)

15. DATA SHEETS

TARGET (x,y,z)	HORIZONTAL IMPACT ANGLE X°	VERTICAL IMPACT ANGLE Z°	VELOCITY (KPH)	FMH HIC	HIC(d)
<b>UPPER ROOF</b>					
UR (.,.,.)					
<b>SLIDING DOOR TRACK</b>					
SD (.,.,.)					
<b>ROLL-BAR</b>					
RB1 (.,.,.)					
RB2 (.,.,.)					
<b>STIFFENER</b>					
ST (.,.,.)					
<b>BRACE</b>					
BR (.,.,.)					

**NOTE:** IDENTIFY X,Y,Z REFERENCE POINT FOR THE TARGET LOCATIONS

REMARKS:

RECORDED BY: \_\_\_\_\_ DATE: \_\_\_\_\_

APPROVED BY: \_\_\_\_\_

**15. DATA SHEETS....Continued**

DATA SHEET 2  
GENERAL TEST AND VEHICLE PARAMETER DATA

## TEST VEHICLE INFORMATION:

Year/Make/Model/Body Style: \_\_\_\_\_

NHTSA No.: \_\_\_\_\_; VIN: \_\_\_\_\_; Color: \_\_\_\_\_

INTERIOR TRIM INFORMATION: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

## SUNROOF INFORMATION:

Installed:    \_\_\_ Yes                    \_\_\_ No

Operation:   \_\_\_ Electric                \_\_\_ Manual

## ROLL-BAR INFORMATION:

Installed:   \_\_\_ Yes                    \_\_\_ No

Padded:     \_\_\_ Yes                    \_\_\_ No

Braces:     \_\_\_ Yes                        \_\_\_ No

## GENERAL INFORMATION:

Date Received: \_\_\_\_\_; Odometer Reading: \_\_\_\_\_ miles

## DATA FROM VEHICLE'S CERTIFICATION LABEL:

Vehicle Manufactured By: \_\_\_\_\_

Date of Manufacture: \_\_\_\_\_; VIN: \_\_\_\_\_

GVWR: \_\_\_\_\_ kg; GAWR FRONT: \_\_\_\_\_ kg

GAWR REAR: \_\_\_\_\_ kg

**15. DATA SHEETS....Continued**

DATA FROM TIRE PLACARD:

Tire Pressure with Maximum Capacity Vehicle Load:

FRONT: \_\_\_\_\_ kpa                  REAR: \_\_\_\_\_ kpa

Recommended Tire Size: \_\_\_\_\_;    Load Range-\_\_\_\_\_

Recommended Cold Tire Pressure:

FRONT: \_\_\_\_\_ kpa                  REAR: \_\_\_\_\_ kpa

Size of Tires on Test Vehicle: \_\_\_\_\_

Type of Spare Tire: \_\_\_\_\_;    Space Saver: \_\_\_\_\_;    Standard: \_\_\_\_\_

VEHICLE CAPACITY DATA:

Type of Front Seats:    Bench-\_\_\_\_\_;Bucket-\_\_\_\_\_;    Split Bench-\_\_\_\_\_

Number of Occupants:    Front-\_\_\_\_\_; Rear-\_\_\_\_\_; TOTAL-\_\_\_\_\_

VEHICLE CAPACITY WEIGHT (VCW) = \_\_\_\_\_ kg

No. of Occupants x 150 lbs. = \_\_\_\_\_ kg

Rated Cargo/Luggage Weight (RCLW) = \_\_\_\_\_ kg (Difference)

WEIGHT OF TEST VEHICLE AS DELIVERED AT LABORATORY: (with maximum fluids)

Right Front = \_\_\_\_\_ kg                  Right Rear = \_\_\_\_\_ kg

Left Front = \_\_\_\_\_ kg                  Left Rear = \_\_\_\_\_ kg

TOTAL FRONT = \_\_\_\_\_ kg                  TOTAL REAR = \_\_\_\_\_ kg

% Total Weight = \_\_\_\_\_ %                  % Total Weight = \_\_\_\_\_ %

TOTAL DELIVERED WEIGHT = \_\_\_\_\_ kg

**15. DATA SHEETS....Continued**

## CALCULATION OF VEHICLE'S TARGET TEST WEIGHT:

Total Delivered Weight = \_\_\_\_\_ kg  
 Rated Cargo/Luggage Wt. = \_\_\_\_\_ kg  
 TARGET TEST WEIGHT = \_\_\_\_\_ kg (SUM)

## WEIGHT OF TEST VEHICLE ....

Right Front = \_\_\_\_\_ kg      Right Rear = \_\_\_\_\_ kg  
 Left Front = \_\_\_\_\_ kg      Left Rear = \_\_\_\_\_ kg  
 TOTAL FRONT = \_\_\_\_\_ kg      TOTAL REAR = \_\_\_\_\_ kg  
 % Total Weight = \_\_\_\_\_ %      % Total Weight = \_\_\_\_\_ %

TOTAL TEST WEIGHT = \_\_\_\_\_ lbs.

Weight of Ballast secured in vehicle's cargo area = \_\_\_\_\_ kg

## TEST VEHICLE ATTITUDE:

AS DELIVERED: RF \_\_\_\_\_mm; LF \_\_\_\_\_mm; RR \_\_\_\_\_mm; LR \_\_\_\_\_mm

Pitch Angle @ Right Door Sill = \_\_\_\_\_  
 Pitch Angle @ Left Door Sill = \_\_\_\_\_  
 Roll Angle @ Front Bumper = \_\_\_\_\_  
 Roll Angle @ Rear Bumper = \_\_\_\_\_

FULLY LOADED: RF \_\_\_\_\_mm; LF \_\_\_\_\_mm; RR \_\_\_\_\_mm; LR \_\_\_\_\_mm

Pitch Angle @ Right Door Sill = \_\_\_\_\_  
 Pitch Angle @ Left Door Sill = \_\_\_\_\_  
 Roll Angle @ Front Bumper = \_\_\_\_\_  
 Roll Angle @ Rear Bumper = \_\_\_\_\_

AS TESTED: RF \_\_\_\_\_mm; LF \_\_\_\_\_mm; RR \_\_\_\_\_mm; LR \_\_\_\_\_mm

Pitch Angle @ Right Door Sill = \_\_\_\_\_  
 Pitch Angle @ Left Door Sill = \_\_\_\_\_  
 Roll Angle @ Front Bumper = \_\_\_\_\_  
 Roll Angle @ Rear Bumper = \_\_\_\_\_  
 Vehicle's Wheelbase = \_\_\_\_\_ mm

**15. DATA SHEETS....Continued**

REMARKS:

RECORDED BY: \_\_\_\_\_

DATE: \_\_\_\_\_

APPROVED BY: \_\_\_\_\_

15. DATA SHEETS....Continued

DATA SHEET 3

VEHICLE NHTSA NO: \_\_\_\_\_

VEHICLE MAKE/MODEL/BODY STYLE: \_\_\_\_\_

HORIZONTAL IMPACT ANGLE RANGE FOR A AND B PILLARS

	<b>HORIZONTAL ANGLE SPECIFIED RANGE</b>		<b>MINIMUM HORIZONTAL ANGLE</b>	<b>MAXIMUM HORIZONTAL ANGLE</b>
A-PILLAR	L	195° - 255°	L	L
	R	105° - 165°	R	R
B-PILLAR	L	195° - 345°	L	L
	R	15° - 165°	R	R

AS DETERMINED USING THE PROCEDURES SPECIFIED IN S8.13.4.1

REMARKS:

RECORDED BY: \_\_\_\_\_

DATE: \_\_\_\_\_

APPROVED BY: \_\_\_\_\_

## 15. DATA SHEETS....Continued

## DATA SHEET 4

NHTSA NO: \_\_\_\_\_

VEHICLE MAKE/MODEL/BODY STYLE: \_\_\_\_\_

## VERTICAL IMPACT ANGLE RANGES

	VERTICAL ANGLE SPECIFIED RANGE	MINIMUM VERTICAL ANGLE	MAXIMUM VERTICAL ANGLE
FRONT HEADER	0° - 50°	0°	
REAR HEADER	0° - 50°	0°	
SIDE RAIL	L 0° - 50°	L 0°	L
	R 0° - 50°	R 0°	R
A-PILLAR	L -5° - 50°	L -5°	L
	R -5° - 50°	R -5°	R
B-PILLAR	L -10° - 50°	L -10°	L
	R -10° - 50°	R -10°	R
OTHER PILLARS	L -10° - 50°	L -10°	L
	R -10° - 50°	R -10°	R
REARMOST PILLAR	L -10° - 50°	L -10°	L
	R -10° - 50°	R -10°	R
UPPER ROOF	0° - 50°	0°	
OVERHEAD ROLLBAR	0° - 50°	0°	
BRACE/ STIFFENER	0° - 50°	0°	
SEAT BELT ANCHORAGES	0° - 50°	0°	

AS DETERMINED USING THE PROCEDURES SPECIFIED IN S8.13.4.2

**15. DATA SHEETS....Continued**

THE FOLLOWING TEST DATA PLOTS WILL BE INCLUDED IN EACH FINAL TEST REPORT with the test vehicle NHTSA number, target identification and date of impact test appearing on each plot:

FOR EACH TARGET:

FMH longitudinal acceleration  $A_x$

FMH lateral acceleration  $A_y$

FMH vertical acceleration  $A_z$

FMH resultant acceleration  $A_r$

FMH longitudinal velocity  $V_x$

Each plot shall be on an 8.5 inch by 11 inch page with a scale that does not exceed the maximum value by more than 10%.

REMARKS:

RECORDED BY: \_\_\_\_\_

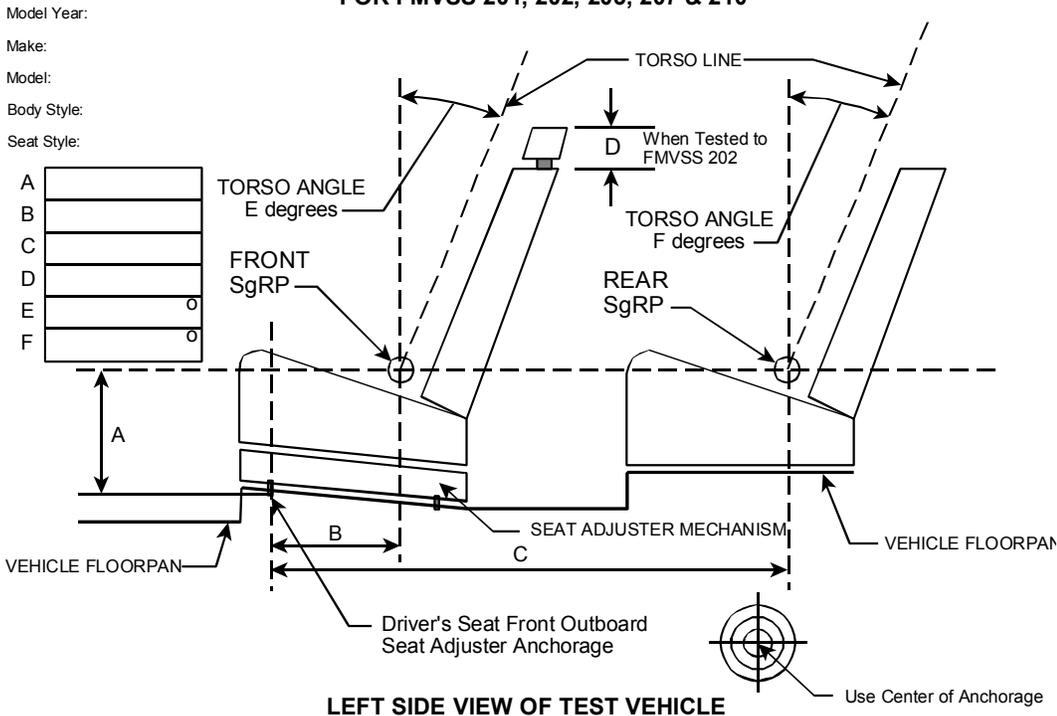
DATE: \_\_\_\_\_

APPROVED BY: \_\_\_\_\_

16. FORMS

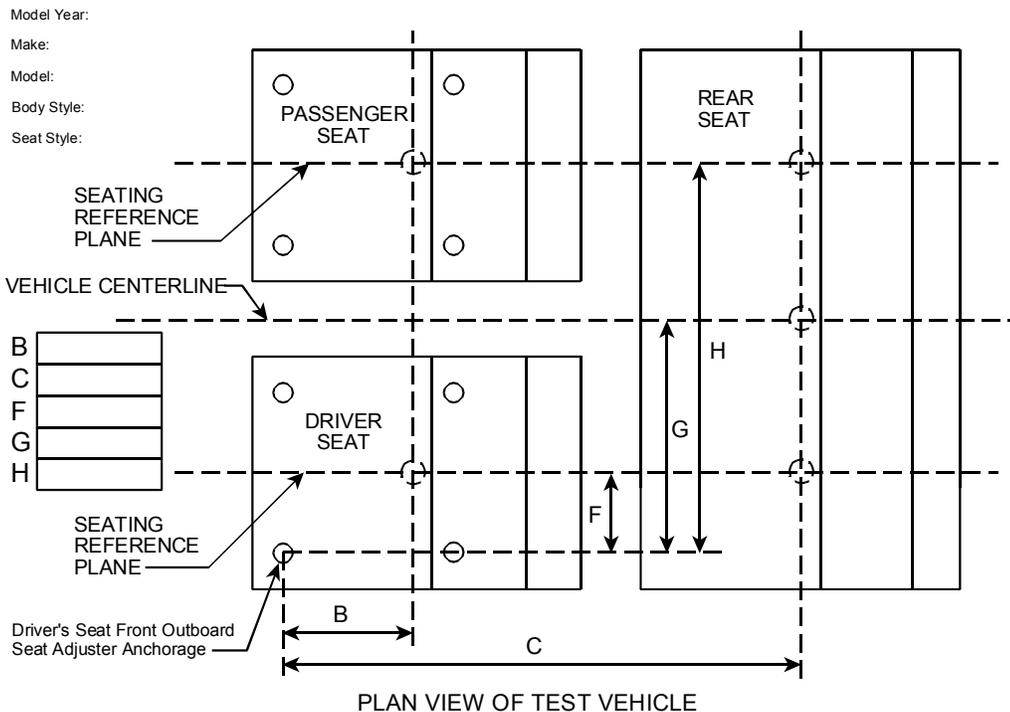
SEATING REFERENCE POINT (SgRP) AND TORSO ANGLE DATA FOR FMVSS 201, 202, 203, 207 & 210

FORM 4  
PAGE 1 OF 3



SEATING REFERENCE POINT (SgRP) AND TORSO ANGLE DATA FOR FMVSS 201, 202, 203, 207 & 210

FORM 4  
PAGE 2 OF 3



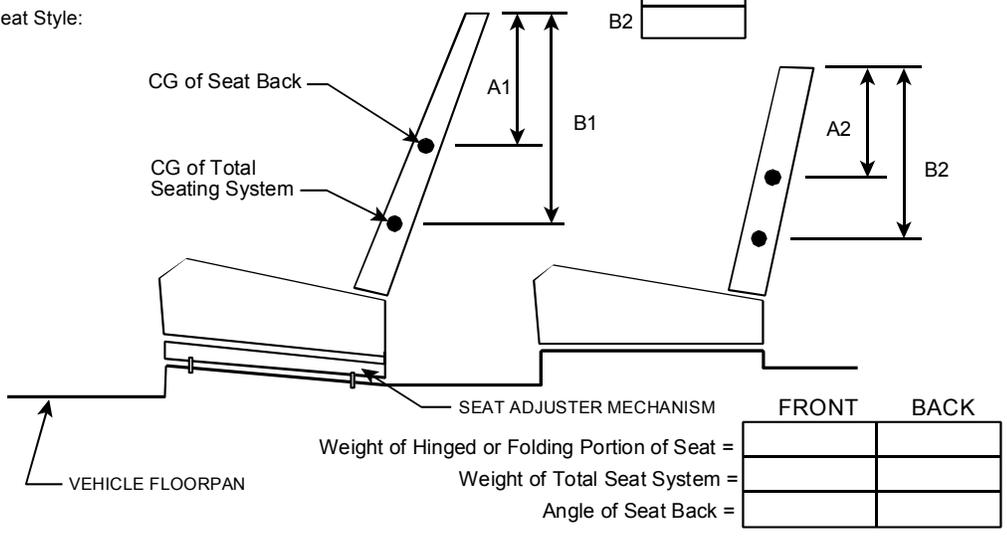
16. FORMS...Continued

TEST VEHICLE SEAT INFORMATION

FORM 4  
PAGE 3 OF 3

Model Year:  
Make:  
Model:  
Body Style:  
Seat Style:

A1
B1
A2
B2

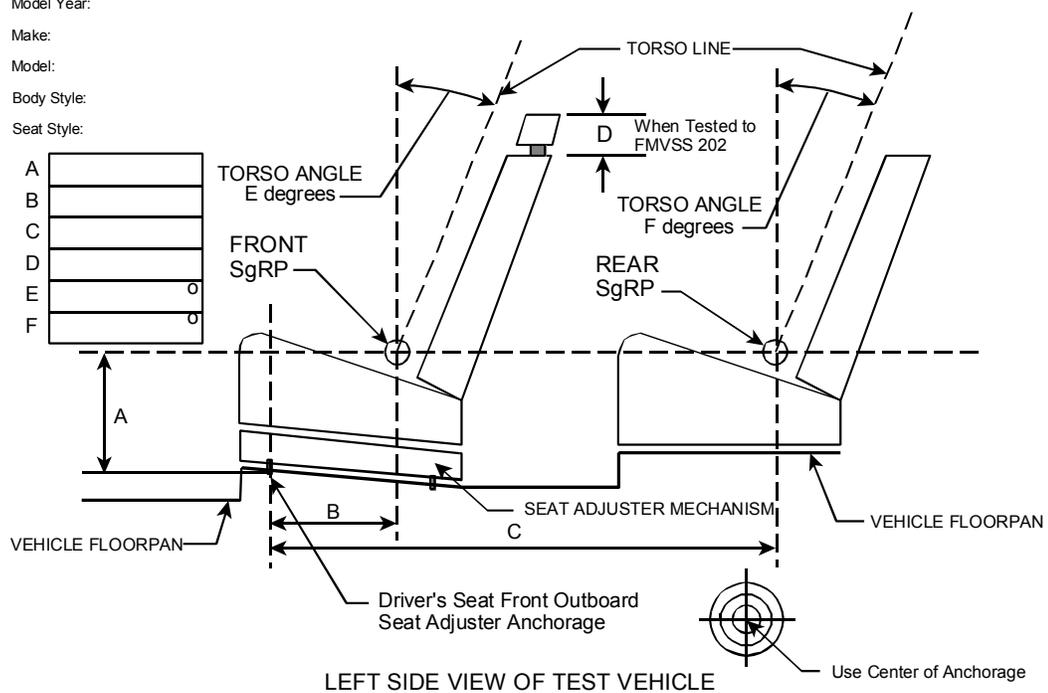


SEATING REFERENCE POINT (SgRP) AND TORSO ANGLE DATA FOR FMVSS 201, 202, 203, 207 & 210

FORM 4  
PAGE 1 OF 3

Model Year:  
Make:  
Model:  
Body Style:  
Seat Style:

A
B
C
D
E
F

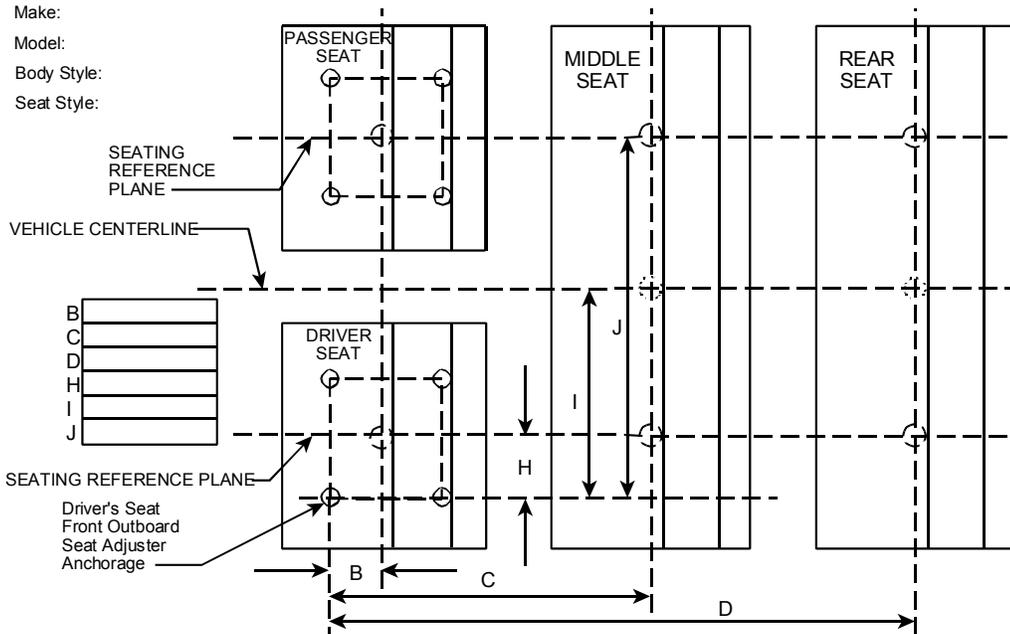


16. FORMS...Continued

SEATING REFERENCE POINT (SgRP) AND TORSO ANGLE DATA FOR FMVSS 201, 202, 203, 207 & 210

FORM 4B  
PAGE 2 OF 3

Model Year:  
Make:  
Model:  
Body Style:  
Seat Style:

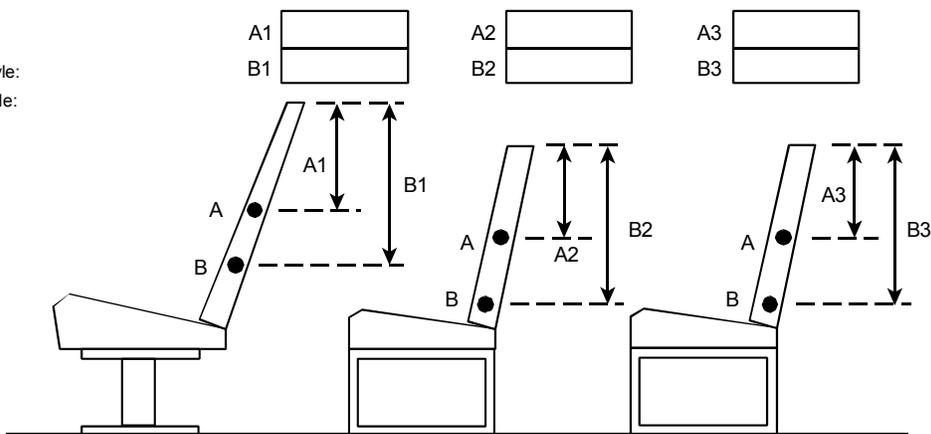


PLAN VIEW OF TEST VEHICLE

TEST VEHICLE SEAT INFORMATION

FORM 4B  
PAGE 3 OF 3

Model Year:  
Make:  
Model:  
Body Style:  
Seat Style:



LEFT SIDE VIEW OF VEHICLE

	FRONT	MIDDLE	BACK
Weight of Hinged or Folding Portion of Seat =			
Weight of Total Seat System =			
Weight of Total Seat System =			

16. FORMS...Continued

MONTHLY TEST STATUS REPORT  
FMVSS 201U  
DATE OF REPORT: \_\_\_\_\_

NO.	VEHICLE NHTSA NO., MAKE & MODEL	COMPLIANCE TEST DATE	PASS / FAIL	DATE REPORT SUBMITTED	DATE INVOICE SUBMITTED	INVOICE PAYMENT DATE
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						

16. FORMS...Continued

MONTHLY VEHICLE STATUS REPORT  
FMVSS 201U  
DATE OF REPORT: \_\_\_\_\_

NO.	VEHICLE NHTSA NO., MAKE & MODEL	DATE OF DELIVERY	ODOMETER READING	TEST COMPLETE DATE	VEHICLE SHIPMENT DATE	ODOMETER READING
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						

**16. FORMS...Continued**

LABORATORY NOTICE OF APPARENT TEST FAILURE TO OVSC

FMVSS NO.: 201U

TEST DATE: \_\_\_\_\_

LABORATORY: \_\_\_\_\_

CONTRACT NO.: \_\_\_\_\_; DELV. ORDER NO: \_\_\_\_\_

LABORATORY PROJECT ENGINEER'S NAME: \_\_\_\_\_

TEST SPECIMEN DESCRIPTION: \_\_\_\_\_  
\_\_\_\_\_

VEHICLE NHTSA NO.: \_\_\_\_\_ VIN: \_\_\_\_\_

MFR: \_\_\_\_\_

APPARENT TEST FAILURE DESCRIPTION: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

FMVSS REQUIREMENT, PARAGRAPH S\_\_\_\_ : \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

NOTIFICATION TO NHTSA (COTR): \_\_\_\_\_

DATE: \_\_\_\_\_ BY: \_\_\_\_\_

REMARKS:

**APPENDIX A  
PART 572L FREE MOTION HEADFORM PERFORMANCE CALIBRATION  
TEST PROCEDURE**

TABLE OF CONTENTS

	PAGE
1. PURPOSE AND APPLICATION.....	A-1
2. GENERAL REQUIREMENTS.....	A-1
3. SECURITY .....	A-2
4. GOOD HOUSEKEEPING.....	A-2
5. TEST SCHEDULING AND MONITORING .....	A-2
6. TEST DATA DISPOSITION.....	A-2
7. GOVERNMENT FURNISHED PROPERTY (GFP).....	A-2
8. CALIBRATION AND TEST INSTRUMENTATION.....	A-3
9. PHOTOGRAPHY.....	A-4
10. DEFINITIONS.....	A-4
11. PRETEST REQUIREMENTS .....	A-4
11.1    TRANSDUCER REQUIREMENTS .....	A-4
11.2    GENERAL TEST CONDITIONS .....	A-5
12. CALIBRATION TEST EXECUTION.....	A-6
13. POST TEST REQUIREMENTS.....	A-10
14. REPORTS .....	A-10
14.1    APPARENT TEST FAILURE .....	A-10
14.2    FINAL PERFORMANCE CALIBRATION REPORTS.....	A-10
15. DATA SHEETS.....	A-12

## **APPENDIX A...Continued**

### **1. PURPOSE AND APPLICATION**

The purpose of this laboratory procedure is to provide Free Motion Headform users (independent testing laboratories under contract with the Office of Vehicle Safety Compliance) with standard test procedures for performing receiving-inspection and performance calibration tests on the Part 572L headform so that repetitive and correlative test results can be obtained. The following test has been developed to establish a uniform calibration procedure for all users as the means of verifying the performance of the Free Motion Headform (FMH).

The laboratory procedure for the calibration of Part 572L headforms must be used by National Highway Traffic Safety Administration (NHTSA) contract laboratories performing FMVSS 201 testing for the Office of Vehicle Safety Compliance (OVSC).

### **2. GENERAL REQUIREMENTS**

The Code of Federal Regulations (49 CFR), Parts 571 and 572, was amended to adopt the Free Motion Headform (FMH) as the test device for testing upper interior components in Federal Motor Vehicle Safety Standard (FMVSS) 201 "Occupant Protection in Interior Impact." Each Part 572L headform used in a compliance test must meet the specifications and performance criteria of Part 572L before and after each vehicle test in order to be an acceptable compliance test tool.

The Part 572L Free Motion Headform (FMH) consists of components and assemblies specified in the drawing and specifications package which is available from Reprographic Technologies, 1111 14 Street, NW, Washington, DC 20005, telephone - 202-408-1107.

### **3. SECURITY**

All NHTSA Part 572L Free Motion Headforms delivered to the contract laboratory as Government Furnished Property (GFP) will be stored in a safe and secure area such as the dummy calibration laboratory. The contractor is financially responsible for any acts of theft and/or vandalism which occur during the storage of GFP. Any security problems shall be reported by telephone to the Industrial Property Manager (IPM), Office of Contracts and Procurement, within two working days after the incident. A letter containing specific details of the security problem will be sent to the IPM (with copy to the COTR) within 48 hours. The contractor is responsible for maintaining the NHTSA test devices in good working order, and shall protect and segregate the data that evolves from conducting Part 572L calibration tests before and after each vehicle component test usage.

No Information concerning the Part 572L calibration data shall be released to anyone except the COTR, unless specifically authorized by the COTR or the COTR's Branch or Division Chief

**APPENDIX A....Continued**

No Individuals, other than contractor personnel directly involved in the P572L calibration test program, shall be allowed to witness calibration tests unless specifically authorized by the COTR.

**4. GOOD HOUSEKEEPING**

Contractors shall maintain the entire calibration laboratory, test fixtures, and instrumentation in a neat, clean, and painted condition with test instruments arranged in an orderly manner consistent with good test laboratory housekeeping practices.

**5. TEST SCHEDULING AND MONITORING**

The Part 572L Free Motion Headforms are being calibrated as test tools to be used in a vehicle component test to determine compliance with the requirements of FMVSS 201. The schedule for these performance calibration tests must be correlated with that of the vehicle component tests. All testing shall be coordinated to allow monitoring by the COTR.

**6. TEST DATA DISPOSITION**

The contractor shall make all FMH calibration data available to the COTR for review and analysis as required. All calibration test data for each particular Part 572L FMH will be sent to the COTR with each test report.

All backup data sheets, strip charts, recordings, plots, technicians notes, etc. shall be either sent to the COTR or destroyed at the conclusion of each delivery order, purchase order, etc.

**7. GOVERNMENT FURNISHED PROPERTY (GFP)**

P572L Free Motion Headforms will be furnished to the contract laboratory by the OVSC. The headforms shall be stored in a secured room which is kept between 55°F and 85°F. The contractor will check headform components for damage after each test and complete a headform damage checklist that will be included with the post test headform calibration. The COTR will be kept informed of the headforms condition in order that replacement parts can be provided. The headforms will be calibrated by the contractor before and after every vehicle test usage.

**APPENDIX A...Continued****8. CALIBRATION AND TEST INSTRUMENTATION**

Before the contractor initiates the performance calibration test program, a test instrumentation calibration system must be implemented and maintained in accordance with established calibration practices. The calibration system shall be set up and maintained as follows:

- A. Standards for calibrating the measuring and test equipment shall be stored and used under appropriate environmental conditions to assure their accuracy and stability.
- B. All measuring instruments and standards shall be calibrated by the contractor, or a commercial facility, against a higher order standard at periodic intervals not exceeding 6 months for instruments and 12 months for calibration standards. Records, showing the calibration traceability to the National Institute of Standards and Technology (NIST), shall be maintained for all measuring and test equipment.

Accelerometers shall be calibrated every 6 months or after a vehicle fails to meet the FMVSS 201 performance requirements, whichever occurs first.

- C. All measuring and test equipment and measuring standards shall be labeled with the following information:
  - (1) Date of calibration
  - (2) Date of next scheduled calibration
  - (3) Name of the technician who calibrated the equipment
- D. A written calibration procedure shall be provided by the contractor which includes, as a minimum, the following information for all measurement and test equipment:
  - (1) Type of equipment, manufacturer, model number, etc.
  - (2) Measurement range
  - (3) Accuracy
  - (4) Calibration interval
  - (5) Type of standard used to calibrate the equipment (calibration traceability of the standard must be evident)

**APPENDIX A....Continued**

- (6) The actual procedures and forms used to perform calibrations.
- E. Records of calibrations for all test instrumentation shall be kept by the contractor in a manner that assures the maintenance of established calibration schedules. All such records shall be readily available for inspection when requested by the COTR. The calibration system will need the written acceptance of the COTR before testing begins.
- F. Test equipment shall receive a calibration check immediately prior to and after each test. This check shall be recorded by the test technician(s) and submitted with the final report.
- G. Anthropomorphic test devices shall be calibrated before and after each vehicle test. These calibrations shall be submitted with the final report.

Further guidance is provided in the International Standard ISO 10012-1, "Quality Assurance Requirements for Measuring Equipment" and American National Standard ANSI/NCSL Z540-1, "Calibration Laboratories and Measuring and Test Equipment – General Requirements.

**9. PHOTOGRAPHIC DOCUMENTATION**

Provide still photographs (8 x 10 inch or 8.5 x 11 inch glossy color prints properly focused for clear images) of post test calibration damage resulting from the vehicle component test.

**10. DEFINITIONS**

NONE

**11. PRETEST REQUIREMENTS****11.1 TRANSDUCER REQUIREMENTS**

The contractor shall provide and install the following instrumentation to the P572L FMH.

**HEAD** — The head accelerometers shall have dimensions, response characteristics and sensitive mass locations specified in drawing SA 572-S4 and be mounted in the head as shown in drawing 92041-001.

Three Endevco 7264-2000 accelerometers with 1% Transverse Sensitivity shall be mounted in the head cavity to measure orthogonal accelerations (Ax, Ay, Az) at the center of gravity (CG) of the head assembly.

## APPENDIX A...Continued

The sign convention for outputs of transducers mounted within the FMH must conform to the sign convention shown in the Free Motion Headform User's Manual and in Figure A1, Free Motion Headform Accelerometer Sign Convention.

The mountings for accelerometers shall have no resonant frequency within a range of 3 times the frequency range of the applicable channel class.

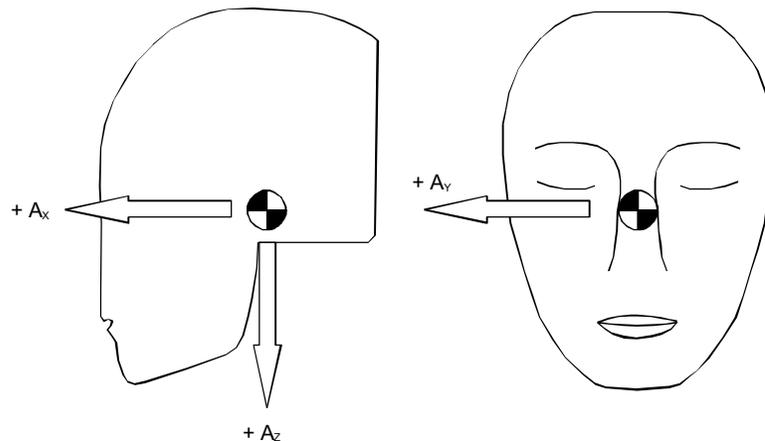
The outputs of acceleration devices installed in the FMH specified by this part are recorded with individual data channels. Each data channel will be comprised of a sensor, signal conditioner, data acquisition device, and all interconnecting cables, and must conform to the requirements of SAE Recommended Practice J211, MAR 95, "Instrumentation for Impact Test," Class 1000.

All filter classes should be of the "phaseless" type to be compatible with the "time" dependent test parameters.

### 11.2 GENERAL TEST CONDITIONS

- A. Surfaces of the FMH components are not painted unless otherwise specified.
- B. FMH performance tests of the same component, segment, assembly are separated in time by a period of not less than 30 minutes unless otherwise specified.
- C. FMH performance tests are conducted at any temperature from 19°C to 26°C unless otherwise specified and at any relative humidity from 10% to 70% after exposure of the dummy to these conditions for a period of not less than 4 hours.

FREE MOTION HEADFORM (FMH)  
ACCELEROMETER SIGN CONVENTION



**FIGURE A1**

**APPENDIX A...Continued****12. COMPLIANCE TEST EXECUTION**

## HEAD DROP TEST

- A. The main components of the FMH: an aluminum skull, a steel skull cap plate, a 6-axis upper neck load simulator, a head skin and three (3) accelerometers for measuring the test parameters. All applicable Part 572L and Part 572E drawings are listed on the Bill of Materials (92041-018).
- B. The weight of the head assembly is  $4.54 \text{ kg} \pm 0.05 \text{ kg}$ .
- C. The skull cap screws (1/4-20) should be torqued to 18.1 N-m.
- D. Accelerometers and their respective mounts should be inspected to ensure the mounting surfaces are smooth and clean and provide a good mechanical interface. Mounting screws should be torqued to their proper value.
- E. The data acquisition system, including transducers, must conform to the requirements of SAE Recommended Practice J211, MAR 95 for Channel Class 1000.

## 12.1 TEST PROCEDURE

- A. Soak the head assembly in a test environment at any temperature between  $19^{\circ}\text{C}$  and  $26^{\circ}\text{C}$  and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to a test.
- B. Visually inspect the head skin for cracks, cuts, abrasions, etc. Repair or replace the head skin if the damaged area is more than superficial. Note: If the damage resulted from the vehicle component impact test in which the headform was used the damaged area is to be documented with photography and the post test calibration testing completed before any replacement or repairs are made.
- C. Clean the impact surface of the skin and the impact surface of the fixture with isopropyl alcohol, trichloroethane or equivalent prior to the test.
- D. Suspend the head assembly in a manner similar to that shown in Figure A2, Headform Drop Test Setup Specifications. Position the forehead below the chin such that the skull cap plate is at an angle of  $28.5^{\circ} \pm 0.5^{\circ}$  with the impact surface when the midsagittal plane is vertical. The 1.575 mm (0.062 in) diameter holes located on either side of the FMH are used to ensure the head is level with respect to the impact surface. A typical test setup is shown in Figure A3.

**APPENDIX A....Continued**

- E. Drop the head assembly from a height of 376 mm  $\pm$  1 mm by a means that ensures a smooth, instant release onto a rigidly supported flat, horizontal steel plate with dimensions of 610 mm x 610 mm x 50.8 mm. The impact surface is to be clean and dry and have a microfinish in the range of 0.2 microns to 2.0 microns.

**NOTE:** The masses of the suspension device and the accelerometer cables are to be kept as lightweight as possible to minimize their effect on the test results.

- F. Allow a period of at least 3 hours between successive tests on the same head assembly.

**12.2 PERFORMANCE SPECIFICATIONS (S572.102 (a))**

- A. The peak resultant acceleration shall not be less than 225 Gs and not more than 275 Gs.
- B. The resultant acceleration vs. time history curve shall be unimodal to the extent that oscillations occurring after the main pulse shall not exceed 10% of the peak resultant acceleration.
- C. The lateral acceleration shall not exceed 15 Gs.

APPENDIX A...Continued

# HEADFORM DROP TEST SETUP SPECIFICATIONS

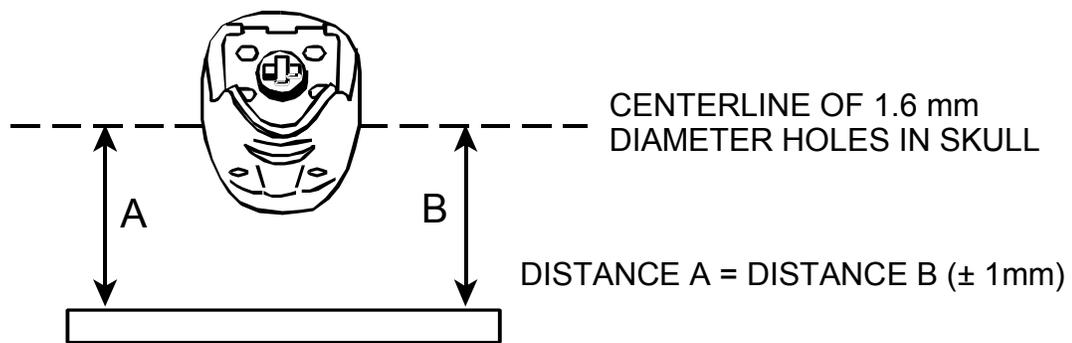
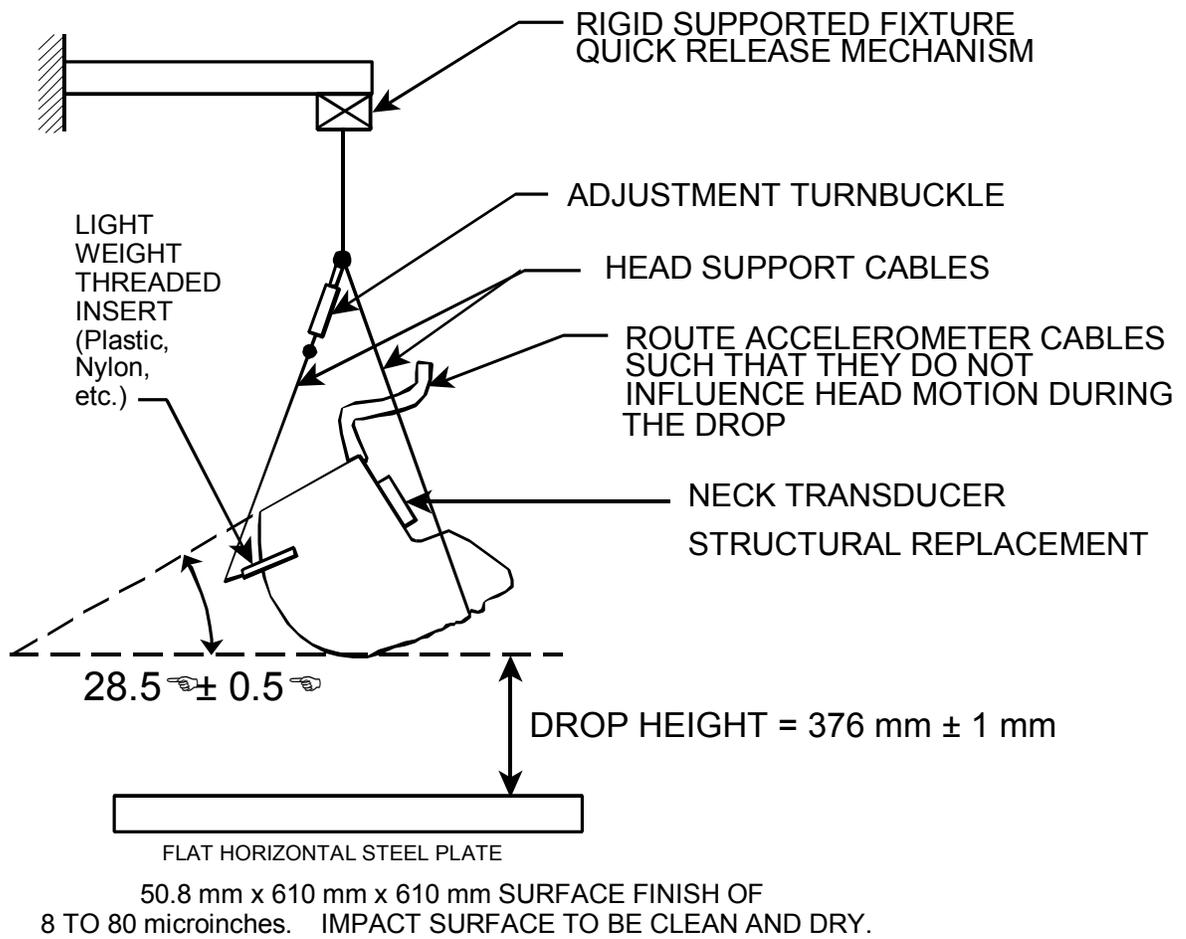


FIGURE A2

# HEAD DROP TEST SETUP

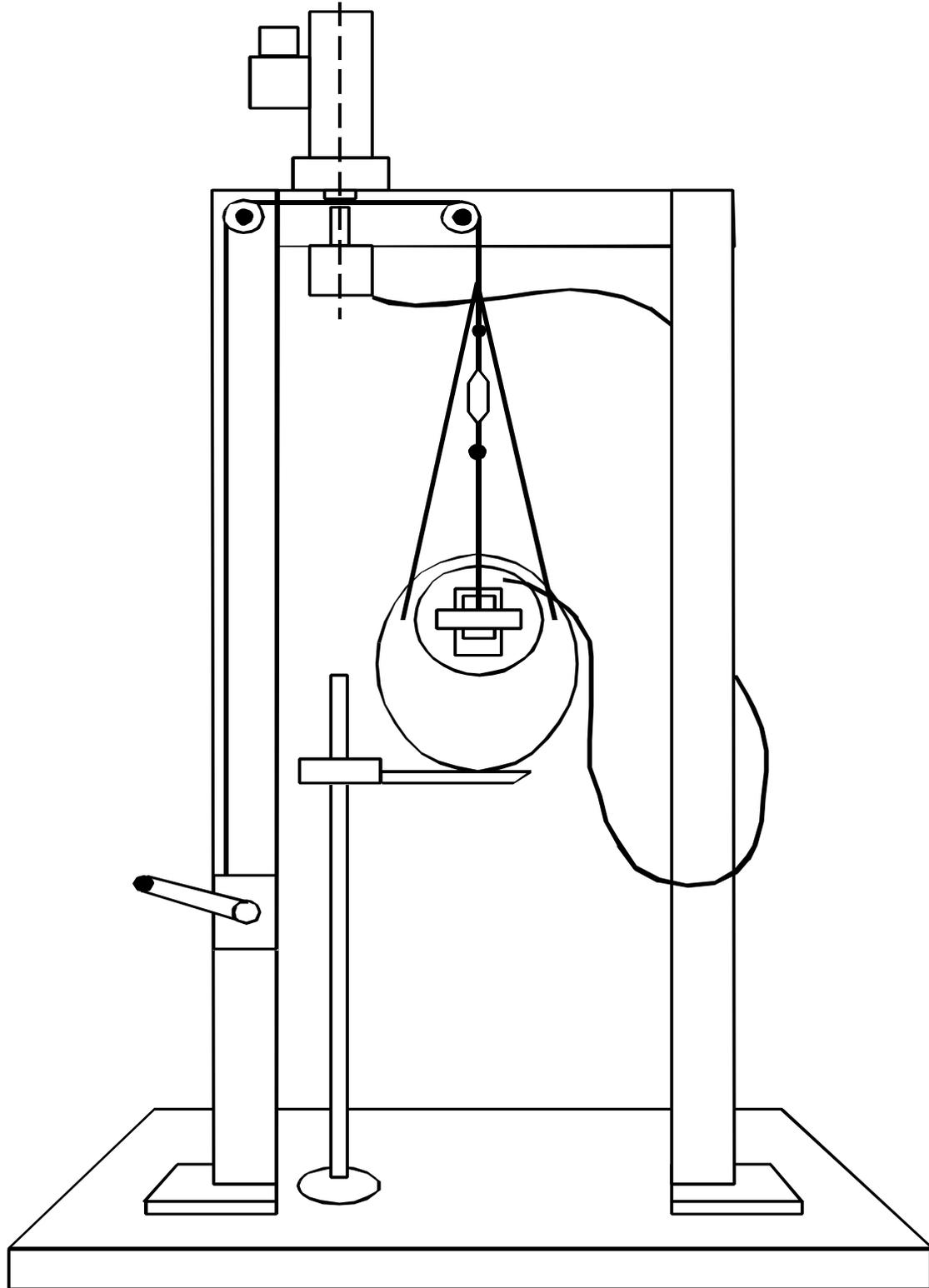


FIGURE A3

**APPENDIX A...Continued****13. POST TEST REQUIREMENTS**

The contractor shall verify all instrumentation and check data sheets and photographs. Make sure data is recorded in all data blocks on every performance calibration test data sheet.

**14. REPORTS****14.1 APPARENT NONCONFORMANCE**

During the post test calibration, any indication of apparent nonconformance to the requirements of Regulation P572L shall be communicated by telephone to the COTR within 24 hours with written notification mailed within 48 hours (Saturdays and Sundays excluded). Written notification shall be submitted with a copy of the particular test data sheet(s) and preliminary data plot(s).

In the event of an apparent nonconformance, a post test calibration check of some critically sensitive test equipment and instrumentation may be required for verification of accuracy. The necessity for the calibration shall be at the COTR's discretion and shall be performed without additional costs to the OVSC.

**14.2 FINAL PERFORMANCE CALIBRATION REPORTS****14.2.1 COPIES**

A report containing the pre and post test calibration data for each Part 572L headform used in the vehicle compliance test shall be submitted with FMVSS 201 final test report for the vehicle tested.

Contractors are required to PROOF READ all Final Test Reports before submittal to the COTR. The OVSC will not act as a report quality control office for contractors. Reports containing a significant number of errors will be returned to the contractor for correction, and a "hold" will be placed on invoice payment for the particular test.

**14.2.2 REQUIREMENTS**

Performance calibration report Table of Contents shall include the following:

Section 1 — Purpose of Calibration Test

Section 2 — Calibration Data Summary

Section 3 — Test Data

Section 4 — Test Equipment List and Calibration Information

**APPENDIX A...Continued**

## Section 5 — Photographs (if applicable)

The test data for each FMH will be presented in separate sections. Each section shall contain a title page, test results summary and the test data. The title page shall include the FMH's serial number and the manufacturer's name. It will also indicate whether the calibration data is pre or post test. The test results sheets will provide a summary of each test and describe any damage, failures and/or corrective action taken. The test data shall include the pass/fail data sheets, the time histories for each data channel used to determine the pass or fail status, and instrumentation calibration data sheets.

## 14.2.3 FIRST PAGE

## FRONT COVER

A heavy paperback cover (or transparency) shall be provided for the protection of the final report. The information required on the cover is as follows:

- A. Final Report Title And Subtitle such as —

P572L PERFORMANCE CALIBRATION  
IN SUPPORT OF  
VEHICLE SAFETY COMPLIANCE TESTING  
FOR OCCUPANT PROTECTION IN INTERIOR IMPACT

- B. Contractor's Name and Address such as

ABC TESTING LABORATORIES, INC.  
405 Main Street  
Detroit, Michigan 48070

**NOTE:** DOT SYMBOL WILL BE PLACED BETWEEN ITEMS (B) AND (C)

- C. Date of Final Performance Calibration Report completion

- D. The sponsoring agency's name and address as follows

U. S. DEPARTMENT OF TRANSPORTATION  
National Highway Traffic Safety Administration  
Safety Assurance  
Office of Vehicle Safety Compliance  
400 Seventh Street, SW  
Room 6115, Mail Code: NSA-30  
Washington, DC 20590

APPENDIX A...Continued

15. DATA SHEETS (EXAMPLES)

PART 572L  
HEAD DROP TEST

MANUFACTURER/ID NO.:		
CALIBRATION DATE:		
TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	19°C to 26°F	22°C
RELATIVE HUMIDITY	10% to 70%	27%
PEAK RESULTANT ACCELERATION	225 Gs to 275 Gs	270.63 Gs
PEAK LATERAL ACCELERATION	15 Gs Maximum	-7.43 Gs
IS ACCELERATION CURVE UNIMODAL?	YES	YES

REMARKS:

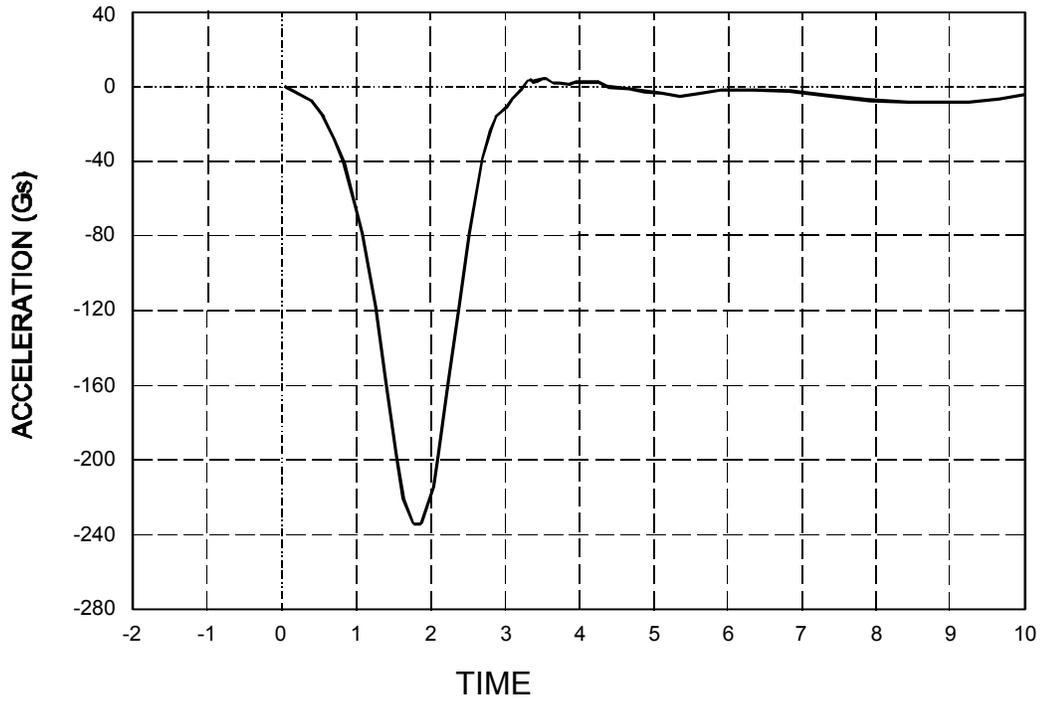
RECORDED BY: \_\_\_\_\_

DATE: \_\_\_\_\_

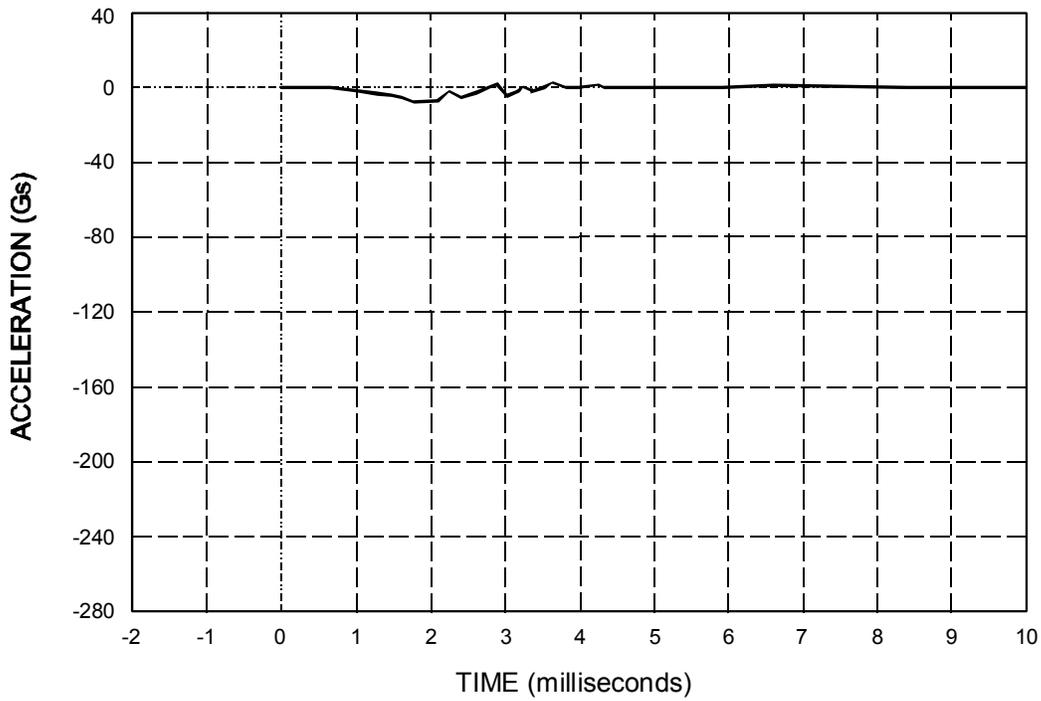
APPROVED BY: \_\_\_\_\_

APPENDIX A...Continued

PART 572L FMH HEAD CALIBRATION - HEAD ACCELERATION X AXIS

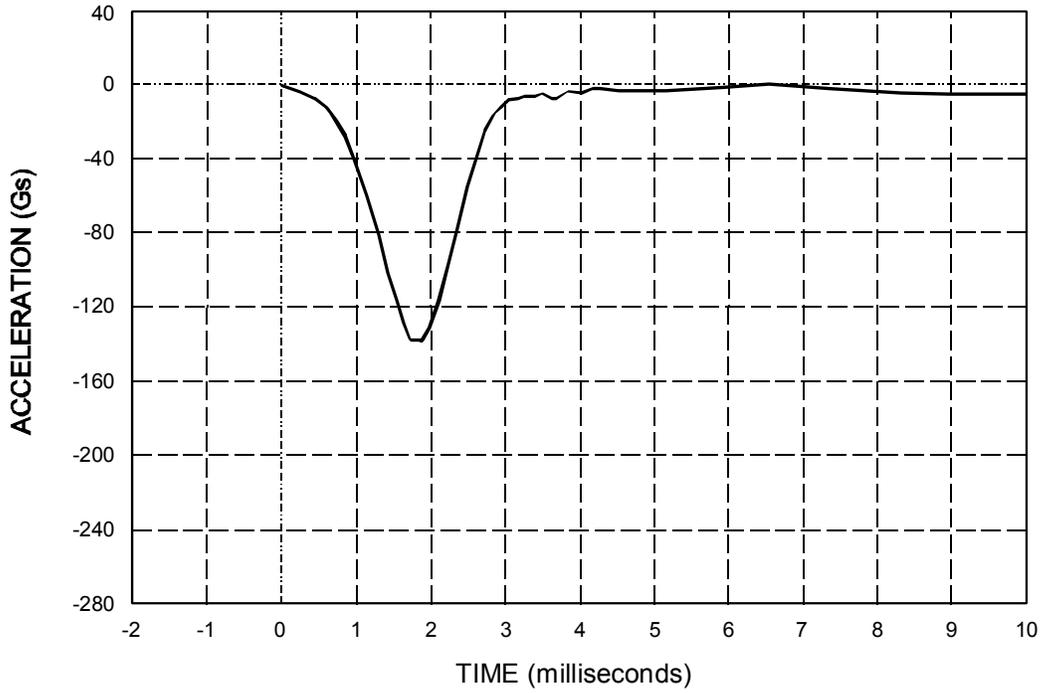


PART 572L FMH HEAD CALIBRATION - HEAD ACCELERATION Y AXIS

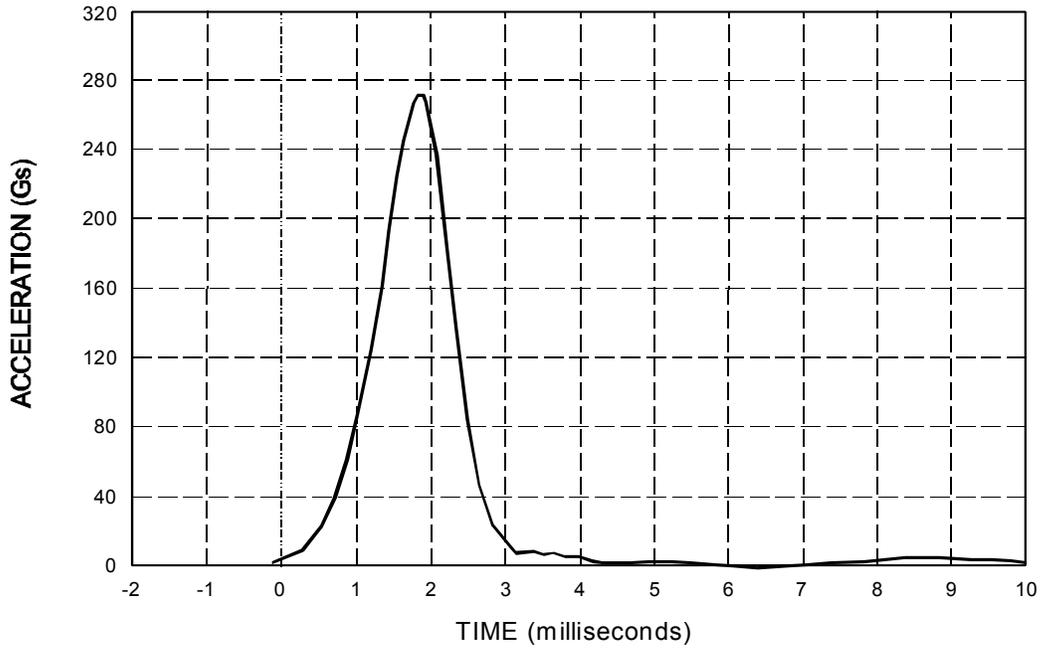


APPENDIX A...Continued

PART 572L FMH HEAD CALIBRATION - HEAD ACCELERATION Z AXIS



PART 572L FMH HEAD CALIBRATION - HEAD RESULTANT ACCELERATION



APPENDIX A...Continued

PART 572L  
DUMMY DAMAGE CHECKLIST

FMH Serial No.: \_\_\_\_\_; Project No: \_\_\_\_\_

**OK** **Damaged** (Begin with general cleaning)

\_\_\_\_ \_\_\_\_\_ Outer skin of headform -  
Check for gashes, rips, etc.

\_\_\_\_ \_\_\_\_\_ Head - Check that ballast is secure  
\_\_\_\_ \_\_\_\_\_ Gashes, rips, general appearance, etc.

\_\_\_\_ \_\_\_\_\_ Transducer Leads -  
Torn cables

\_\_\_\_ \_\_\_\_\_ Accelerometer Mountings -  
Check for secure mounting

\_\_\_\_ \_\_\_\_\_ Other - \_\_\_\_\_

If upon visual examination, damage is apparent in any of these areas, the appropriate engineer or engineering technician is to be consulted for a decision on repair or replacement of parts.

Repair or Replacement approved by:

\_\_\_\_\_  
Signature Date

COMMENTS ON REPAIR OR REPLACEMENT OF PARTS:

Checked by:

\_\_\_\_\_  
Signature Date

APPENDIX A...Continued

PART 572L  
SAMPLE INSTRUMENTATION CALIBRATION INFORMATION

I.D. NUMBER	MANUFACTURER	MODEL NUMBER	SERIAL NUMBER	DATE OF LAST CALIBRATION	DATE OF NEXT CALIBRATION
FMH INSTRUMENTATION					
HEAD ACCELEROMETERS					
1 - LONGITUDINAL	ENDEVCO	7264-2000			
2 - LATERAL	ENDEVCO	7264-2000			
3 - VERTICAL	ENDEVCO	7264-2000			

RECORDED BY: \_\_\_\_\_

DATE: \_\_\_\_\_

APPROVED BY: \_\_\_\_\_

**APPENDIX B**  
**USER'S MANUAL FOR THE**  
**Part 572L FREE-MOTION HEADFORM**  
**Version 2, March 1995**

## INTRODUCTION

The National Highway Traffic Safety Administration (NHTSA) has issued a Final Rule to upgrade Federal Motor Vehicle Safety Standard Number 201 (FMVSS 201). The intent of this regulation is to increase the level of occupant protection in head impacts with vehicle upper interior structures. The test procedure requires that a Part 572-Subpart L Free-Motion Headform (FMH) be propelled into the various upper interior structures at a speed of 24.1 km/h. The performance of a vehicle structure is evaluated based on the HIC responses of the FMH.

In developing the test procedure, the NHTSA selected a free-motion type impactor, as opposed to a more traditional guided impactor. The FMH specified in the final rule is based on the head of a Part 572 Subpart E (Hybrid-III) dummy and was used throughout the agency's research program. It has four main components (excluding accelerometers): an aluminum skull, a steel skull cap plate, a 6-axis upper neck load cell simulator, and a head skin. The drawing package for the FMH consists of 19 drawings and/or part numbers which are specific to the Part 572L headform (numbered 92041-001 through -018, plus SA572-S4). All these drawings are dated November 30, 1992. This package also includes five drawings from the Part 572E dummy drawing package. All applicable Part 572L and Part 572E drawings and part numbers for this package are listed on the Bill of Materials (92041-018). Copies of the FMH drawing package are available from Reprographic Technologies, 1111 14th Street, NW, Washington, D.C. 20005, telephone (202) 408-1107.

For illustrative purposes only, this user's manual describes the FMH configured with three Endevco model 7264-2000 accelerometers, and associated mounting hardware, positioned to measure the acceleration of the center of gravity of the headform. Instrumentation options allow for the use of any accelerometers which meet the specifications described in drawing SA572-S4. It is recommended that the user inform the headform manufacturer of the type of accelerometer to be used. This will insure obtaining a correctly ballasted headform and the correct mounting blocks, if these blocks are purchased from the headform manufacturer.

## DISASSEMBLY AND INSPECTION

Completely disassemble and check every newly purchased FMH against the engineering drawing package. Pay particular attention to parts that are critical to the performance of the FMH. Use the following procedure for this effort.

Loosen two #10-32x1/4 inch socket head set screws which secure the head to neck pivot pin (78051-339), then remove the pin (see **FIGURE 1**). Unscrew four FHCS 1/4-20x3/4 inch long screws from the skull cap plate (92041-004) and remove the plate (see **FIGURE 2**). Next, remove the four 1/4-28x3/4 inch long cap screws and washers which attach the 6-axis upper neck load cell simulator (92041-009) to the base of the headform (see **FIGURE 3**). Extract the

APPENDIX B...Continued

REMOVAL OF NECK PIVOT PIN

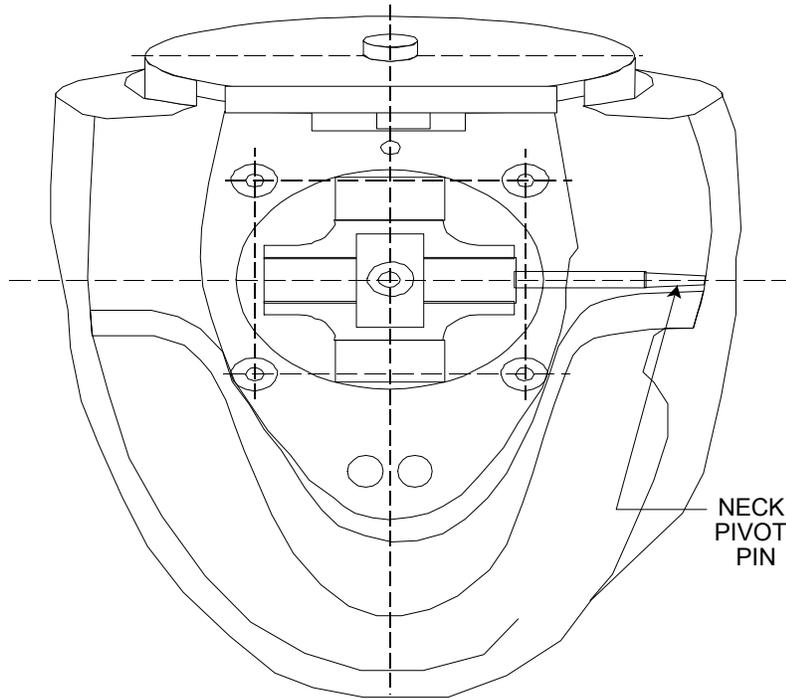


FIGURE 1

REMOVAL OF SKULL CAP PLATE

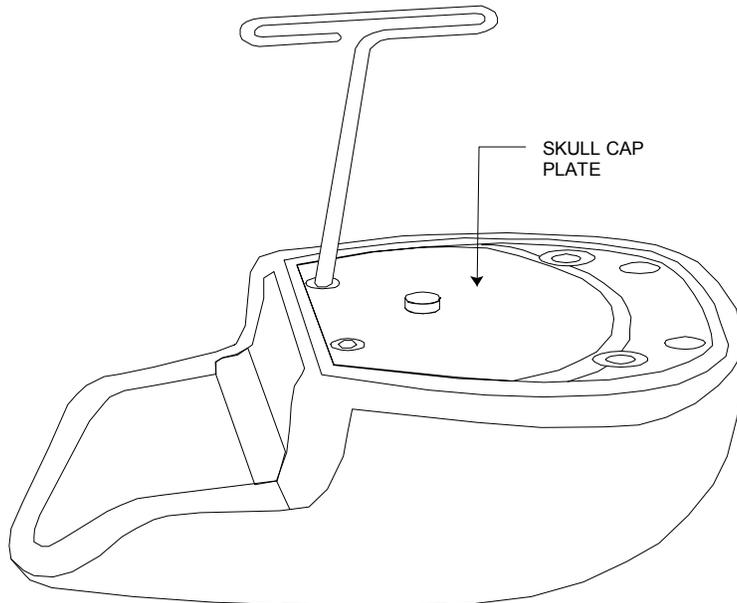
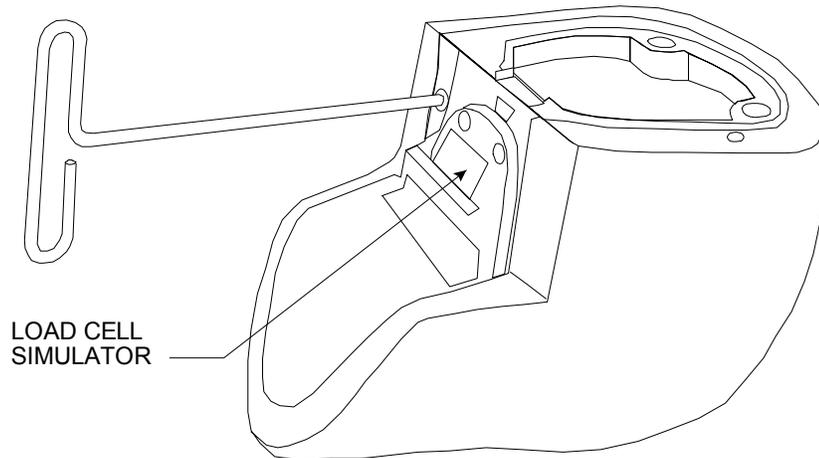


FIGURE 2

## APPENDIX B...Continued

REMOVAL OF 6-AXIS UPPER NECK  
LOAD CELL SIMULATOR

load cell simulator through the back of the skull. Then, unscrew the four #10-24x3/8 inch long screws from the accelerometer cube adaptor plate (e.g. Denton B-1780) and remove the plate and cube from the load cell simulator (see **FIGURE 4**). Finally, remove the #4-40x3/8 screw which holds the accelerometer mounting cube (e.g. Denton B-1778) to the adaptor plate, and lift off the cube.

Remove the skin from the skull and check for tears and general quality. Check the thickness of the head skin in the locations shown in drawing number 92041-008. The thickness must be  $11.20 \pm 0.79$  millimeters (0.441 inches  $\pm$  0.031 inches).

Inspect the skull for smoothness and freedom from flat spots and pits. Inspect the bond of the head ballast weight. If it is necessary to reinstall or change the ballast, see drawing number 92041-001 for information on headform weight, moment of inertia, and bonding.

## APPENDIX B...Continued

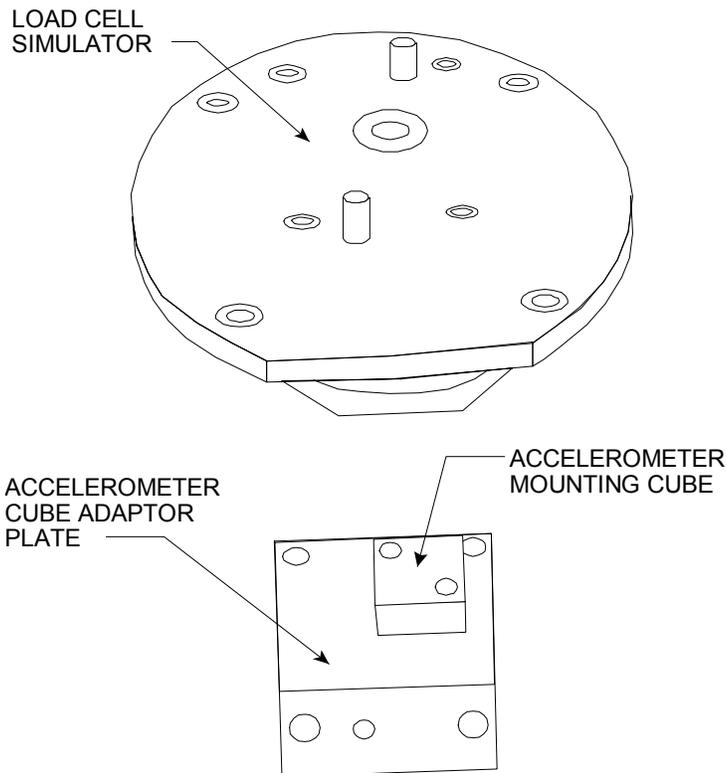
REMOVAL OF ACCELEROMETER CUBE  
ADAPTOR PLATE

FIGURE 4

## ASSEMBLY

Reversing the disassembly instructions, attach the center of gravity accelerometer mounting cube to the cube adaptor plate. Then mount the adaptor plate to the 6-axis upper neck load cell simulator. Also attach three accelerometers to the mounting cube. Again reversing the disassembly instructions, replace the 6-axis upper neck load cell simulator, the neck pivot pin, and the head skin. Replace the skull cap plate and weigh the headform. The headform weight, center of gravity (CG) location, and moment of inertia must conform to drawing number 92041-001. (**NOTE:** For other types of accelerometers, use mounting hardware appropriate for those devices rather than that described here. Maintain the correct headform weight, center of gravity location, and moment of inertia). Tighten the various screws used in the headform to the following torque specifications:

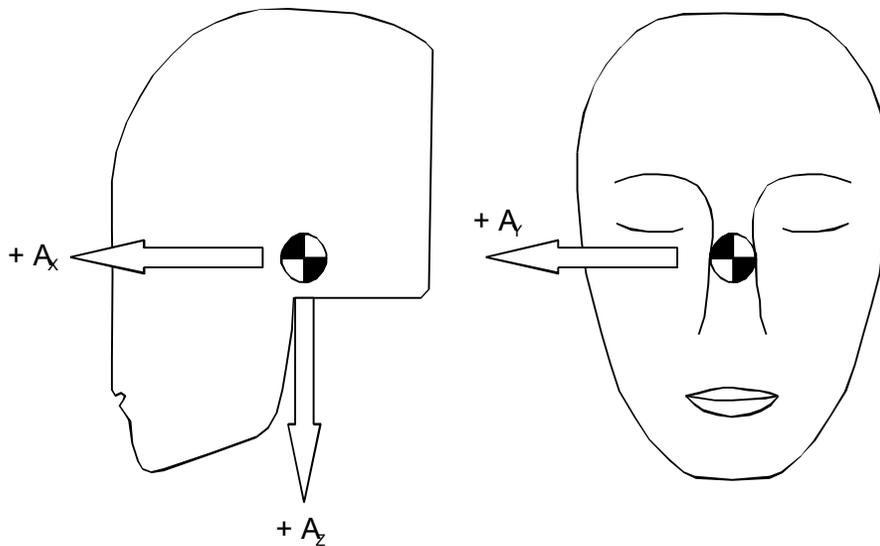
## APPENDIX B...Continued

DESCRIPTION OF SCREW	SCREW SIZE	TORQUE, N-M (IN-LB)
Skull Cap Plate Screws	1/4-20x3/4	18.1 (160)
Neck Load Cell Simulator Screws	1/4-28x3/4	13.6 (120)
Head to Neck Pivot Pin Set Screws	#10-32x1/4	5.7 (50)
Accelerometer Mounting Block Screws (e.g.)	#4-40x	0.6 (5)
Cube Adaptor Plate Screws (e.g.)	#10-32x3/8	5.7 (50)

## FREE-MOTION HEADFORM POSITIVE SIGN CONVENTION

The instrumentation for the FMH consists of three accelerometers positioned to measure the acceleration of the headform's center of gravity. The positive sign conventions for these transducers are as shown in **FIGURE 5**.

FREE MOTION HEADFORM (FMH)  
ACCELEROMETER SIGN CONVENTION



**FIGURE 5**